NEW JERSEY DEPARTMENT of HEALTH and SENIOR SERVICES

Public Health Consultation

Drinking Water Quality Analyses
March 1996 to June 1999
United Water Toms River

Dover Township
Ocean County, New Jersey

Public Comment Release

Public Comment Period:
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Prepared Under a Cooperative Agreement with the:

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
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ATSDR

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Prepared by:

Hazardous Site Health Evaluation Program
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New Jersey Department of Health and Senior Services (NJDHSS)

Division of Science, Research and Technology
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Under a Cooperative Agreement between the NJDHSS and the
Agency for Toxic Substances and Disease Registry (ATSDR)

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Abbreviations

µg/l	Micrograms per liter
ATSDR	Agency for Toxic Substances and Disease Registry
CACCCC	Citizens' Action Committee on Childhood Cancer Cluster
CAFT	Center for Advanced Food Technology (Rutgers University)
GAC	Granular Activated Carbon
HPLC-MS	High Performance Liquid Chromatography - Mass Spectrometry
IARC	International Agency for Research on Cancer
MCL	Maximum Contaminant Level
mg/kg	Milligrams per kilogram
MTBE	Methyl Tertiary-Butyl Ether
NJDEP	New Jersey Department of Environmental Protection
NJDHSS	New Jersey Department of Health and Senior Services
NPL	National Priorities List
OCHD	Ocean County Health Department
PAH	Polycyclic Aromatic Hydrocarbons
PCE	Tetrachloroethylene (Perchloroethylene)
pCi/l	Picocuries per liter
PHAP	Public Health Action Plan
PPG	Polypropylene Glycol
SAN	Styrene-Acrylonitrile (Trimer)
TCA	1,1,1-Trichloroethane
TCE	Trichloroethylene
THMs	Trihalomethanes
THNA	4-Cyano-1,2,3,4-Tetrahydro-"-Methyl-Naphthalene-Acetonitrile
THNP	4-Cyano-1,2,3,4-Tetrahydro-1-Naphthalene-Propionitrile
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
UWTR	United Water Toms River

Summary

This Public Health Consultation presents the results of extensive sampling and testing of the United Water Toms River (UWTR) community water supply serving most of Dover Township (Ocean County), New Jersey, for the period March 1996 through June 1999. The testing was conducted as part of a Public Health Response Plan developed by the New Jersey Department of Health and Senior Services (NJDHSS) and the federal Agency for Toxic Substances and Disease Registry (ATSDR) to address concerns about elevated childhood cancer incidence in the community. The purpose of the testing was to evaluate the current quality of the drinking water supply in response to concerns expressed by the community. In addition, the testing was conducted to determine if there are any characteristics of the community drinking water system that were unique to the Dover Township area, and that would warrant examination in epidemiologic studies of childhood cancer in the area.

The NJDHSS and the New Jersey Department of Environmental Protection (NJDEP) took samples from 23 wells, eight points of entry to the distribution system, and over 20 locations in the distribution system of UWTR. Samples were tested for a much broader range of chemical and radiological contaminants than is required under State and federal regulations, including: volatile organic chemicals, semi-volatile organic chemicals, pesticides and related chemicals, non-volatile, high molecular weight organic chemicals, metals, asbestos, nitrate and nitrite, gross alpha and gross beta radiological activity, and radium. The NJDHSS Division of Public Health and Environmental Laboratories conducted most of the analyses, but other governmental, academic and private laboratories were also utilized.

In most respects, the UWTR appears typical of groundwater-based community water supplies in southern New Jersey. However, samples of certain wells at the Parkway well field and parts of the UWTR distribution system, taken in March and April 1996, were found to contain low levels of trichloroethylene (TCE) and a previously unidentified substance later determined to be styrene-acrylonitrile (SAN) trimer. These contaminants are attributable to the Reich Farm hazardous waste site (CERCLIS #NJD980529713). Two of the Parkway wells (#26 and #28) had been treated by packed tower aeration since 1988 to remove TCE, but a third well (#29) showed sporadic contamination with TCE during this testing period. In response to the discovery of SAN trimer in November 1996, the Parkway well field was voluntarily shut down by UWTR. By May 1997, activated carbon treatment to remove SAN trimer had been installed on wells #26 and #28, and the treated water was discharged to the ground (although this treated water could be pumped into the distribution system at times of high water demand). In June 1999, activated carbon treatment was installed for wells #29 and #22 at the Parkway well field, to protect against sporadic or potential contamination. At present, the public health implications of past SAN trimer contamination cannot be determined since very little is known about its toxicological properties. The NJDHSS, NJDEP and ATSDR support a program of toxicological testing, including the

potential for carcinogenicity, currently being developed and coordinated by the U.S. Environmental Protection Agency.

In addition to the identification of SAN trimer, the presence of other non-target chemicals in the Reich Farm groundwater plume, and possibly in past samples of the community water supply, is under investigation by a committee coordinated by NJDEP.

TCE has been a common drinking water contaminant in New Jersey and the U.S., frequently at levels higher than what was found in the UWTR system. TCE is classified as a probable human carcinogen based on studies of workers and experimental animals exposed to high levels. While some epidemiologic studies suggest that exposure to TCE in drinking water is possibly related to increased risk of childhood leukemias, these studies are not conclusive.

NJDHSS, NJDEP and ATSDR recommend continued treatment of the Parkway wells affected by the Reich Farm groundwater contamination plume. At this time, because of the efforts described above, exposure to Reich Farm-related contaminants through the Parkway well field has been interrupted. This interruption of exposure is contingent on control of the Reich Farm groundwater contamination plume and the effectiveness of treatment systems should contaminants enter operating wells. On-going water monitoring is necessary to document the effectiveness of plume management and water treatment.

Gross alpha radiological activity in some points of entry is elevated, particularly those in which a large proportion of water comes from the shallow Kirkwood-Cohansey aquifer. According to the NJDEP and the U.S. Geological Survey, relatively high gross alpha activity, attributable to naturally occurring radium species, is a problem that is not confined to the Dover Township area. Rather, there appears to be a general elevation in radium-related activity throughout the shallower aquifer systems of southern New Jersey and in parts of northern New Jersey. To better understand the phenomenon, the NJDEP and the U.S. Geological Survey should continue to conduct research into the occurrence of radiological contaminants in the groundwaters of New Jersey. NJDHSS, NJDEP and ATSDR also recommend well field management that minimizes the use of wells with the higher levels of gross alpha activity.

Lead and copper were found in first-draw samples of several of the distribution system (schools) samples, indicating corrosion of metals from building plumbing. Corrosion is a problem common to many water systems and private wells. NJDEP, NJDHSS, and ATSDR recommend routine flushing of taps and water fountains before use to minimize exposure.

The occurrence of SAN trimer, a current indicator of the Reich Farm groundwater contamination plume, appears to be a characteristic unique to Dover Township. Although little is presently known of the SAN trimer's toxicological characteristics, past exposure to Parkway well field water should be considered in epidemiologic investigations of childhood cancer in the area.

Background and Statement of Issues

Purpose

To address concerns about elevated incidence of childhood cancer in Dover Township (Ocean County), the New Jersey Department of Health and Senior Services (NJDHSS) and the federal Agency for Toxic Substances and Disease Registry (ATSDR), in cooperation with the Ocean County Health Department (OCHD) and the Citizens' Action Committee on Childhood Cancer Cluster (CACCCC), developed and are implementing a Public Health Response Plan (NJDHSS and ATSDR, 1996). One part of the plan is a thorough analysis of the quality of the public drinking water supply serving most of the township, conducted by the NJDHSS and the New Jersey Department of Environmental Protection (NJDEP). Beginning in March 1996, samples of water have been collected from the community drinking water supply and analyzed for hundreds of organic and inorganic chemicals and for radiologic activity. The purpose of this evaluation is to identify whether there are any unusual characteristics of the water system that would warrant further public health investigation or actions to reduce exposure.

This Health Consultation presents the results of this water supply evaluation for the period March 1996 through June 1999. To establish context, this Public Health Consultation also provides a description and history of the community water supply and a summary of the sampling and analytical methods employed.

United Water Toms River

Most of Dover Township, Ocean County is served by United Water Toms River (UWTR), an investor-owned water company, formerly called Toms River Water Company. Portions of the township located on the barrier island are served by other community water systems[1]. (These systems were not evaluated and are not discussed in this Public Health Consultation.) Some mainland areas of the township are not served by any community water system; homes in these areas obtain their drinking water from private wells. It should also be noted that within the area served by UWTR, some homes may not be connected to UWTR, but instead use private wells for drinking water. Figure 1 shows the present, approximate service area of UWTR. (Note that UWTR also serves the borough of South Toms River and part of Berkeley Township.)

<u>Water Sources</u> The approximately 85,000 customers of UWTR receive their drinking water by an interconnected distribution system supplying water from eight "points of entry." Each

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[1] A *community water system* (or public water system) consists of any drinking water delivery system with at least 15 service connections or 25 residents.

point of entry (located on Figure 1) is fed water by one or more groundwater wells tapping into underground water-bearing sands, or aquifers. UWTR currently operates more than 20 wells that feed these points of entry; the specific wells and well fields used at any time are determined by UWTR, in response to daily and seasonal changes in water demand. A schematic diagram illustrating the relationship between wells, points of entry, and the distribution system is provided as Figure 2.

Table 1 summarizes the characteristics of each well in service in the system, arranged by point of entry, and including years of operation, well depth, pumping capacity, and the aquifer tapped. Most wells withdraw groundwater from the shallow Kirkwood-Cohansey aquifer system; others tap the deeper Piney Point and Potomac/Raritan/Magothy aquifers.

Water from each point of entry is treated with hypochlorite for disinfection, and lime for pH adjustment and corrosion control before entering the distribution system. Wells at some points of entry are also treated to control iron. After 1988, water from wells #26 and #28 at the Parkway well field underwent packed tower aeration treatment to remove volatile organic chemicals. Granular activated carbon treatment was instituted for the output from these two wells in May 1997. As of June 1999, Parkway wells #22 and #29 also are being treated with granular activated carbon.

History of Compliance Monitoring (Before 1996) Under State and federal regulations[2], all community water systems in New Jersey are required to test regularly the drinking water that is piped to homes and businesses. Drinking water must be tested by laboratories certified by NJDEP to conduct specific tests. Community water systems are required to report the results of analyses to the NJDEP; these results are then compared to drinking water standards (called Maximum Contaminant Levels, or MCLs) established by regulations based on both federal and State Safe Drinking Water Acts. Where and how frequently samples are taken, and which laboratory tests must be done, are also set by U.S. Environmental Protection Agency (USEPA) and NJDEP rules under the federal and State Safe Drinking Water Acts, respectively.

Sampling location is an important consideration in drinking water testing. Samples of untreated well water reflect the quality of water as it is drawn from the underground aquifer. For regulatory compliance, samples for most contaminants are usually taken at the point of entry to the distribution system. Samples at these locations characterize treated water entering the distribution system. Samples taken in the distribution system provide a description of actual water quality experienced by consumers because: 1) the concentration of some contaminants may be affected by the composition of the distribution system pipes or building plumbing (such as lead); 2) the

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[2] New Jersey Administrative Code, Title 7, Chapter 10, New Jersey Safe Drinking Water Act Regulations; U.S. Code of Federal Regulations, Title 40, Chapter 1, Subchapter D, Part 141, National Primary Drinking Water Regulations.

concentration of some contaminants may change with time spent in the distribution system (such as disinfection by-products or bacteria).

A single sample from a community water system that exceeds a drinking water standard does not necessarily mean that the standard is violated. NJDEP usually conducts or requires additional sampling to confirm the presence of contamination and to determine its extent and sources. For some kinds of contaminants subject to seasonal variation (such as disinfection by-products), multiple samples over a period of time are typically required before a regulatory decision is made.

UWTR drinking water is subjected to routine tests for approximately 80 regulated chemical, radiological and microbiological contaminants. These tests, the standards used to evaluate them, the sampling frequency, and UWTR's compliance history before 1996 are summarized in Table 2. Details of interest are provided below.

Drinking water at various locations in the distribution system and leaving each UWTR point of entry has been tested for *volatile organic chemicals*. In the summer of 1987, trichloroethylene (TCE) was detected in the distribution system and traced to the Parkway well field, specifically wells #26, #28 and #29. TCE had also been found in these wells in samples taken in 1986 and 1987 as part of the Remedial Investigation for the Reich Farm Superfund site (NUS, 1986; Ebasco, 1988). NJDEP regulations setting a MCL of 1 µg/l for TCE became effective in 1988. In response, UWTR completed installation of a packed tower aeration treatment system (air stripper) in 1988 to remove volatile organic chemicals from wells #26 and #28. Since then, treatment has been generally effective at removing TCE, but there have been occasional low level detections due to treatment failures and sporadic occurrences of TCE in well #29. The TCE is thought to come from the plume of contaminated groundwater associated with the Reich Farm Superfund site located approximately one mile north of the Parkway well field.

The distribution system is monitored quarterly for *disinfection by-products* (that is, trihalomethanes). All sample results have been low and typical for a community water supply that uses groundwater and disinfects with chlorine.

Asbestos is now tested for once every nine years in the UWTR system. NJDEP granted UWTR a sampling waiver from this routine test based on the noncorrosive (non-acidic) characteristics of the drinking water (after treatment with lime) in the distribution system. Corrosive (acidic) water has the potential to dissolve the concrete in asbestos cement pipe in the water distribution system, thereby releasing asbestos fibers.

Lead and copper have been tested in samples taken from different locations in the distribution system in accordance with state and federal regulations. These metals are commonly found in drinking water samples due to corrosion of building plumbing. Although the lead and copper test results met standards, UWTR has installed corrosion control treatment to comply with regulations, because it serves a relatively large population.

Nitrate is tested for once per year at each point of entry. *Nitrite* is tested for once every three years at each point of entry. All nitrate and nitrite samples taken at UWTR points of entry have been below the allowable limits.

Radiological activity is initially assessed by gross alpha and beta activity in samples taken once every four years from the water distribution system, once an initial monitoring period consisting of four quarterly samples has been completed. Historically, radiological results for the UWTR system have been in compliance with radiological activity standards.

Microbiological testing at UWTR consists of approximately 100 samples per month tested for the presence of total coliform bacteria. Samples are taken from different locations in the water distribution system throughout the month. The total coliform bacteria test is an indicator for the possible presence of other, disease-causing bacteria. The absence of total coliform bacteria indicates that the water delivered to consumers is free of disease-causing bacteria. There have been no bacteriological violations in the UWTR system.

<u>National Priorities List (NPL) Sites in Relation to the Community Water Supply</u> There are two NPL sites in Dover Township (Ocean County), Ciba-Geigy (CERCLIS #NJD001502517) and Reich Farm (CERCLIS #NJD980529713). The source of Reich Farm contamination was the dumping in 1971 of chemical wastes from a Union Carbide Corporation facility in Bound Brook, New Jersey by a waste hauling contractor. Both sites are thought to have impacted certain community water supply wells at some time period. Two of the wells at the Parkway well field are currently affected by the Reich Farm groundwater contamination plume (and a third well at Parkway is sporadically impacted), but the beginning of the period of contamination is not known with certainty. Shallow wells at the Holly well field were apparently contaminated for a period of time in the mid-1960s with materials from Ciba-Geigy (then known as Toms River Chemical Co.). These issues are or will be more fully described in other documents developed under the Public Health Response Plan, in particular the Public Health Assessment for Reich Farm (NJDHSS and ATDSR, 1999) and the Public Health Assessment for Ciba-Geigy currently in preparation by NJDHSS and ATSDR.

Community Concerns

The elevated incidence of childhood cancer in Dover Township (NJDHSS, 1997) has raised concerns in the community about possible links with environmental contamination, particularly in relation to the two Superfund sites. At a public meeting in March 1996, members of the community expressed specific concerns about the community drinking water supply. To address this concern the NJDHSS and ATSDR, in cooperation with the NJDEP, committed to extensive sampling and testing of the community water supply, which is the subject of this Public Health Consultation.

Statement of Issues

This Public Health Consultation comprehensively examines and evaluates the chemical and radiological characteristics of the UWTR supply, based on extensive sampling and analysis conducted from March 1996 to June 1999. In addition, the NJDHSS and ATSDR consider whether there are aspects of the community water supply that are unusual or unique, indicating that water-related exposures should be examined in the epidemiologic investigation of childhood cancer incidence in Dover Township.

Methods

In order to perform a thorough evaluation of water quality, water samples from UWTR were analyzed for a much broader range of chemical and radiologic contaminants than is required under State and federal regulations. Samples were tested using several standard analytical methods. Some standard methods were modified or enhanced during the investigation to improve measurement of specific contaminants. In addition, non-standard methods were employed to analyze for unregulated classes of contaminants of potential concern.

For each method, all target analytes were evaluated. In addition, some methods were used to consider non-target analytes, that is, substances for which the method is not specifically tuned to measure but is capable of detecting its presence in the sample. For most of the tested contaminants, there are no established regulatory standards, nor are there past data from UWTR or data from other water systems to serve as appropriate comparisons.

The drinking water analyses described below were conducted primarily by the Division of Public Health and Environmental Laboratories of the NJDHSS (hereafter referred to as the NJDHSS Laboratory). Additional testing was done by the laboratory formerly maintained by the NJDEP, the Center for Advanced Food Technology (CAFT) at Rutgers University, QC Laboratories (a commercial laboratory in Southampton, Pennsylvania), and Lancaster Laboratories (a commercial laboratory in Lancaster, Pennsylvania).

For this investigation, all samples of the UWTR system were taken by staff of the NJDHSS or NJDEP. Chain-of-custody of sample containers was documented for each sample from the laboratory to collection and back to (and within) the laboratory. Trip and/or field blanks were collected with each sample batch to be analyzed using organic chemical methods. Laboratory quality control and quality assurance procedures are described for each method in the data package volumes compiled by the NJDHSS Laboratory.

Sampling Strategies

Initially, in March and April 1996, the UWTR system was characterized through the collection of samples from a number of locations in the distribution system, each point of entry then in operation, and several of the wells feeding the points of entry. Other, seasonally used points of entry were sampled as they were brought on line. Eventually, water from each individual well in the UWTR system was sampled.

Subsequent sampling patterns were determined on the basis of findings from these initial rounds of tests and the availability of enhancements to standard analytical methods. As will be discussed below, selected points of entry and wells were subjected to additional monitoring for radiological activity and organic chemicals. Table 3 provides a complete summary of the sampling efforts described in this Health Consultation.

In response to community concerns about the quality of water at Toms River area schools, initial distribution system samples were taken on March 28, 1996 at 21 public and private schools geographically dispersed throughout Dover Township and surrounding communities served by UWTR. At each school, several sample bottles were filled with tap water in preparation for a variety of chemical and radiological analyses. Two samples were taken for lead and copper: a first draw sample, representing water that has been in contact with plumbing overnight, and a flushed sample, representing water as it was delivered to the school from the distribution system.

At the time of this initial sampling, water in the system originated from five points-of-entry -- South Toms River, Indian Head, Route 70, Berkeley and Parkway -- which feed into the system at various locations. These points of entry were sampled on April 4, 1996 for chemical and radiological analyses. The remaining three points-of-entry were sampled initially as they came on line: April 24, 1996 (Holly) and July 8, 1996 (Brookside and Windsor).

Four community water system wells outside of Dover Township were sampled to provide a basis for comparison, as was a commercial brand of bottled water. Two elementary schools in the Toms River School District but outside of both Dover Township and the UWTR service area (Beachwood and Pine Beach) were also sampled and tested for comparison.

Distribution system samples provide the best indication of the quality of water used by a consumer in the UWTR service area. Untreated well water does not necessarily represent what consumers drink, because: 1) treatment affects water quality (by removal of some contaminants and introduction of some treatment by-products); 2) at some points of entry, water from different wells is blended prior to entry into the system, and, once in the system, water from different points of entry may be mixed; and 3) contaminants such as lead and copper may be introduced by corrosion of water pipes and building plumbing. However, monitoring of untreated water is important to understand the condition of the sources of the water supplying the system rather than as a direct measure of human exposure to contaminants.

Analytical Methods

The standard water testing methods described below have been developed to measure the presence and/or amount of chemical contaminants or radiological activity in a given sample. Each method is designed to detect and quantify the list of specific "target analytes" as shown in Table 4.

<u>Organic Chemical Analyses</u> Water samples were tested using the following analytical methods. Organic chemical testing methods generally consist of three distinct steps. First, the target analytes may be *extracted* from the water; next, analytes may be *separated* from each

other; and finally, analytes are *detected* and identified. Methods are capable of measuring different chemicals because of differences in the procedures used for extraction, separation and detection. Results are typically expressed in micrograms of chemical per liter of water (µg/l), also known as parts per billion (ppb).

In addition to the list of target analytes, the presence of other, *non-target* substances may be suggested by some chemical methods. Some of these non-target substances may be *tentatively identified* by the laboratory analyst although the method was not specifically designed to detect and measure them.

> *Volatile Organic Chemicals (USEPA Method 524.2)* This method identifies and measures approximately 60 volatile organic chemicals in drinking water, including common commercial solvents and dry cleaning fluids, components of fuel oil and gasoline, components of plastics, and many other chemical products and intermediates. These substances are evaporated from the water sample, trapped, separated by a gas chromatograph, and detected with a mass spectrometer. During the investigation, the NJDHSS Laboratory enhanced the standard USEPA method to be able to measure acrylonitrile by a technique called selected ion monitoring.

> *Semi-volatile Organic Compounds (USEPA Methods 525.2 and 625)* The 525.2 method identifies and measures over 35 organic chemicals including phthalates (common components in plastics), some insecticides and herbicides, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (or PAHs, components of crude oil, tar, pitch, or smoke). The 625 method identifies and measures approximately 60 organic chemicals including chlorinated benzenes, ethers, nitrosamines, chlorinated and nitrogen-containing phenols, phthalates and PAHs. Method 625 is intended for analyses of wastewater, and although it has more target analytes than Method 525.2, its method detection limits are less sensitive. In both methods, semi-volatile compounds are extracted, separated by gas chromatography, and detected with a mass spectrometer. (In the course of the investigation, the NJDHSS Laboratory (and Lancaster Laboratories) developed an enhanced version of the 525.2 method capable of measuring styrene-acrylonitrile trimer.)

> *Pesticides, Pesticide Metabolites, and Related Chemicals (USEPA Methods 504, 505, 507, 515.2 and 531.2)* These methods measure approximately 90 commonly used pesticides and pesticide metabolites including herbicides and insecticides, and PCBs. Initial distribution system (school) samples and well samples were analyzed using Methods 505 and 507 only (these two methods cover approximately 60 pesticides and their metabolites). The points of entry were initially analyzed using all pesticide methods. These methods use a variety of special extraction and separation steps, followed by measurement with special detectors. The 505 method analyses were conducted by the NJDHSS Laboratory. The other method analyses were conducted initially by the NJDEP laboratory, but upon closure

of the NJDEP's chemical laboratory in July 1996, these analyses were conducted by QC Laboratories.

Non-volatile, High Molecular Weight Organic Chemicals (HPLC-MS Method) This non-standard method identifies and measures nonvolatile, ionic organic chemicals not detectable by the conventional analytical methods described above. The method uses solvent or solid phase extraction, separation by high performance liquid chromatography and detection by a mass spectrometer. This analysis was conducted for NJDEP by the CAFT laboratory at Rutgers.

<u>Inorganic Chemical Analyses</u> A variety of methods were used to detect and measure metals, asbestos and other inorganic substances.

Metals Distribution system, point of entry and well water samples were analyzed for the following metals using graphite furnace atomic absorption spectrometry and inductively coupled plasma spectrometry by the NJDHSS Laboratory: antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, molybdenum, nickel, selenium, thallium and tin. Mercury was measured using cold vapor atomic absorption spectrometry.

Asbestos Each school water sample and selected wells were analyzed for asbestos content (number of fibers greater than 10 microns per liter of water) by the NJDHSS Laboratory. Samples were filtered to trap fibers, and the filters were then examined using transmission electron microscopy.

Other Inorganic Substances Nitrate, nitrite, and other inorganic substances were measured on selected samples using standard methods by the NJDHSS Laboratory.

<u>Radiological Activity Analyses</u> Water analyses also included screening methods for "gross" radiological activity, followed by analyses of activity attributable to specific radioactive elemental isotopes. Analytical results are expressed in picoCuries of radiological activity per liter of water (pCi/l).

Gross Alpha and Beta Activity Distribution system and points-of-entry samples were screened for gross alpha and beta radiological activity by the NJDEP laboratory and (upon closure of the NJDEP laboratory) by the NJDHSS Laboratory. Samples are evaporated on a stainless steel planchet and alpha and beta particle emissions are counted in a low-background gas flow proportional counter. (In the course of the investigation, the standard method was amended so that sample analysis took place within 48 hours of sample collection.)

Radium For samples where gross alpha activity results were above 5 pCi/L (and some with less than that amount), analyses for two isotopes of radium, radium-226 and radium-228, were conducted. Alpha activity is counted following special extraction procedures designed to isolate each isotope.

Other Tests of Radiological Activity Selected samples were analyzed for additional radiological characteristics: uranium, thorium, radon, and gamma activity. Uranium is extracted from water and measured with alpha spectroscopy using passivated implanted planar silicon. Radon activity in water samples is determined with a standard liquid scintillation technique. Gamma spectroscopy quantifies gamma activity attributable to specific radioactive isotopes, and is capable of identifying radionuclides generated by human activities.

Public Health Evaluation of Results: Adult and Child Health Issues

To evaluate the public health implications of the drinking water tests for children and adults, results of analyses were compared to MCLs established by the USEPA and the NJDEP under the federal and State Safe Drinking Water Acts. For substances for which there is no established MCL, other health-based guidance levels set to protect adult and child health, if available, were used for comparison. This Public Health Consultation includes expanded discussion of the public health implications for those substances exhibiting a pattern of occurrence exceeding MCLs or other health-based guidance, or for which little or no toxicological information exists.

Results and Discussion

The following is a summary and evaluation of the results of chemical and radiological analyses of drinking water samples collected from the distribution system, points of entry, and wells of UWTR in the period March 1996 through June 1999. All results have been presented to Dover Township residents in a series of monthly public meetings sponsored by the CACCCC. These data are contained in a comprehensive series of data package volumes including sample chain-of-custody documentation, analytical results, and quality assurance information (NJDHSS, 1996-1999), which are available for public inspection at the NJDHSS in Trenton, the Ocean County Health Department, and the Ocean County Public Library. As of November 1999, all 142 volumes containing UWTR sample data through the end of June 1999 have been released. Table 5 is an index describing the contents of each volume.

Target Organic Chemicals

Organic chemical testing results of UWTR samples are found in Tables 6a to 6d (volatile organic chemicals) and 7a to 7d (other organic chemicals).

<u>Volatile Organic Chemicals</u> (Method 524.2) *Trichloroethylene* (also called TCE) was detected in 11 of 21 distribution (school) drinking water samples from March 28, 1996 at concentrations up to 1.0 Fg/l (Table 6a). TCE was found at 0.9 Fg/l in one point of entry sample (Parkway) on April 4, 1996, where it was also detected in three wells (26, 28 and 29) at levels of 5, 8 and 2 Fg/l, respectively (Table 6b). The MCL for TCE is 1 µg/l. At the time of sampling, TCE was being removed from wells 26 and 28 through packed tower aeration treatment (also called an air stripper) that was installed in 1988. Since no TCE was detected in the water exiting the air stripper, the TCE in the point of entry sample was most likely attributable to well 29. UWTR temporarily directed well 29 water through the air stripper in April 1996.

As described below in the "Non-target Organic Chemicals" section, the Parkway well field was voluntarily taken off-line by UWTR in November 1996 and returned to service (with wells 26 and 28 being treated and pumped to waste) at the end of May 1997. TCE levels in both wells 26 and 28 have generally ranged between 2 and 6 µg/l from mid-1997 to mid-1999, with levels in well 26 tending lower with time and levels in well 28 tending higher with time (Table 6c). In September and October 1997, traces of TCE (below the method detection limit) were found in well 29 but not at the point of entry. TCE was measured at levels above the method detection limit in well 29 from July to early September 1998, (at less than 1 µg/l), but was not detectable at the Parkway point of entry in this period. This contamination episode is thought to be related to over-pumping of well 29 relative to wells 26 and 28.

The solvents *tetrachloroethylene (also called PCE, or perchloroethylene), 1,1,1-*

trichloroethane (TCA), and *1,2-dichloroethane* were also measured at levels up to 2 µg/l in wells 26 and/or 28 in April 1996, but not in the distribution system (school) samples of March 1996. These chemicals were also sporadically reported at lower levels in samples from other shallow Parkway wells. The MCLs for PCE, TCA and 1,2-dichloroethane are 1 Fg/l, 30 µg/l and 2 µg/l.

TCE, PCE and TCA have been common groundwater contaminants in many areas of New Jersey and other parts of the United States. In the mid-1980s, when mandatory monitoring for volatile organics began in New Jersey, approximately 15 to 20% of community water systems contained these solvents at levels between 1 and 100 µg/l (NJDEP, 1987). Due to the imposition of State and federal standards by the late 1980s, the number of people served by community water systems with solvent contamination has decreased dramatically (Cohn et al., 1999).

TCE and PCE are classified by the International Agency for Research on Cancer (IARC) as probable human carcinogens, based on the weight of evidence from laboratory animal experiments and limited human epidemiologic studies (IARC, 1995). Following long-term, high level exposure, TCE has been shown to produce liver cancer in mice and kidney and testicular tumors in rats (IARC, 1995; ATSDR, 1997a). Chronic, high level PCE exposure produces liver cancer in mice and kidney tumors and mononuclear cell leukemia in rats (IARC, 1995; ATSDR, 1996). Epidemiologic studies of occupationally-exposed workers suggest an association between long-term inhalation exposure to high levels of TCE and increased risk of liver and biliary tract cancer and non-Hodgkin's lymphoma (IARC, 1995; ATSDR, 1997a). Increased risks of esophageal cancer, cervical cancer and non-Hodgkin's lymphoma have been observed in workers exposed to high levels of PCE (IARC, 1995; ATSDR, 1996).

TCE and PCE exposure in drinking water has been linked to elevated incidence of cancers in human populations, including leukemia and/or lymphomas in children (MDPH, 1997; Cohn et al., 1994; Lagakos et al., 1984) and to increased risk of adverse developmental effects (Bove et al., 1995; ATSDR, 1997b). Overall, the associations drawn from these limited epidemiologic studies suggest possible risk increases due to exposure to TCE and PCE in drinking water, but are inconclusive. Nonetheless, they do indicate the need for further epidemiologic study (Cantor, 1997). Participants in the ATSDR TCE Exposure Subregistry (approximately 4,300 individuals with past exposure to TCE in drinking water at levels ranging from 2 to 19,000 µg/l) have not reported increased occurrence of cancer (ATSDR, 1993).

1,2-Dichloroethane is also classified as a probable human carcinogen (ATSDR, 1994), while there is no evidence to suggest that TCA is carcinogenic (ATSDR, 1995a).

Chloroform, bromodichloromethane, dibromochloromethane and bromoform are known collectively as trihalomethanes (THM). These compounds are formed as an unintentional result of chlorine disinfection of drinking water to destroy potential disease-causing (pathogenic) microorganisms. The low levels detected in the distribution system (approximately 1 to 5 Fg/L combined) are typical of groundwater disinfected with chlorine (Table 6a). In many parts of New Jersey where surface water is chlorinated for disinfection, THM levels are typically 25 to 75 Fg/L.

Chloroform was also detected at low levels (generally less than 1 or 2 µg/l) with some consistency in some wells, prior to chlorination, indicating that this chemical is present in the aquifer. These wells are: wells 22 and 44 at Parkway, well 32 at South Toms River, well 31 at Route 70, and wells 33, 34 and 35 at Berkeley (Table 6b). According to studies by NJDEP and the USGS, this chemical has previously been detected at low levels elsewhere in the shallow Cohansey aquifer. Although the source or sources are not known with certainty, chloroform in untreated well water may be present due to the common household use of bleach which is discharged to septic tanks and then into groundwater.

The MCL for the total concentration of the THMs is currently 100 Fg/L. The safety of THMs and other chemical by-products of disinfection is currently under study. Some of the THMs and other disinfection by-products have been shown to be carcinogenic in laboratory animal studies (IARC, 1991; ATSDR, 1998a; ATSDR, 1991; ATSDR, 1989). Epidemiologic studies of exposure to disinfection by-products indicate that long-term exposure to relatively high levels increases the risk of bladder cancer and possibly rectal cancer (Cantor, 1997; Morris et al., 1992). Recent studies suggest a possible increase in risk of spontaneous abortion or neural tube birth defects from exposure to the relatively high disinfection by-product concentrations found in chlorinated surface water supplies (Swan et al., 1998; Klotz et al., 1998). Federal regulations governing disinfection practices have recently changed to further limit by-product formation while ensuring effective destruction of pathogens.

Occasionally, other volatile organic chemicals have been detected within the UWTR system. Well 21 at the Holly well field had low levels of *dichlorodifluoromethane* (1 to 2 µg/l) on two occasions in 1996 (Table 6b). *Xylenes, toluene* and/or *ethylbenzene* were measured (up to 12 Fg/l combined) above the detection limits in six of 21 distribution system (school) samples in March 1996, at many of the same sample points where TCE was detected (Table 6a). The MCLs for these compounds are 1,000, 1,000 and 700 Fg/l, respectively. Ethylbenzene and toluene were measured at trace levels at the Parkway point of entry (but not in any of the component wells) in early April 1996. These compounds are common solvents and are also components of fuel oil and gasoline. *MTBE (methyl tertiary-butyl ether)*, another fuel component and frequent drinking water sample contaminant, has been sporadically detected at low levels (0.3 to 3.0 Fg/L) in the Parkway and Route 70 wells and points of entry (Table 6b). MTBE was measured above the detection limit in one school sample (Table 6a), but well below the New Jersey MCL for MTBE of 70 µg/l. Based on animal toxicology studies, MTBE is classified as a possible carcinogen by the USEPA (ATSDR, 1998b)

Naphthalene (also measured with one of the semivolatile methods) was found on two occasions in Berkeley well 34 at a level up to 23 µg/l, and at a trace level in one sample from South

Toms River well 38 (Tables 6a and 6b). A trace of naphthalene was also detected in one school (distribution system) sample (Table 6a) . The New Jersey MCL for naphthalene in drinking water is 300 µg/l. The USEPA has determined that there is insufficient information to classify naphthalene as a carcinogen or non-carcinogen (ATSDR, 1995b)

Volatile organic chemicals were also found in comparison samples, including typically low levels of THMs (Table 6d). One community supply well also contained trace levels of 1,1,1-trichloroethane, 1,2-dichloroethane and MTBE, each below applicable MCLs.

<u>Semivolatile Organic Chemicals</u> (Methods 525.2 and 625) These methods revealed the presence of few originally targeted compounds, but the 525.2 method has now been modified by the NJDHSS Laboratory to measure previously unidentified chemicals (see Non-target Organic Chemicals section below). Of the original target compounds, *phthalates* and a related substance (an *adipate)* were reported frequently, in both samples and in field, trip and laboratory reagent blanks, at levels generally less than 1 Fg/l. The highest reported phthalate level was 2.3 µg/l (Table 7b). Phthalates and adipates are common components of plastic materials, and the low levels detected are likely to be a result of trace contamination of the laboratory or sampling environment from ubiquitous plastics. For this reason, the NJDHSS Laboratory suggests that phthalates at levels below 2 or 3 µg/l probably reflect contamination during sampling, sample handling, and analysis. Even if present, the levels of phthalates are well below health-based guidance levels. Reference guidance for di-n-butyl phthalate, butylbenzyl phthalate and diethyl phthalate in drinking water are 1000, 2000 and 5000 Fg/L, respectively. MCLs for di(2-ethylhexyl) phthalate and di(2-ethylhexyl) adipate are 6 and 400 Fg/L, respectively.

Occasional trace levels of polycyclic aromatic hydrocarbons (PAHs) (for example, *fluorene*) were found in some well and distribution system (school) samples (Tables 7a and 7b). For the PAHs reported, health based guidance levels range from 300 to 3,000 µg/l.

In comparison samples, no phthalates (above 2 µg/l) or other semivolatile target analytes were detected.

<u>Pesticides and Related Compounds</u> (Methods 504.2, 505, 507, 515.2, 531.1) *No target compounds* were present above the method detection limit in any of UWTR distribution system, the point of entry or well water samples. One of the comparison community supply wells, however, contained a trace of the pesticide *prometon* at 0.35 µg/l, far below the USEPA Lifetime Health Advisory level of 100 µg/l (Table 7d).

<u>Non-volatile Organics</u> Polypropylene glycols (PPGs) were detected by the Rutgers CAFT laboratory in all three point of entry samples collected on April 4, 1996 and tested by HPLC-MS methods. None of the four comparison wells sampled in May 1996 contained PPGs. Between June and October 1996, all active wells were sampled for analysis by this method, and none

contained PPGs. No PPGs were detected in a sample of the lime used for corrosion control at the points of entry. Based on these data, it appears that the identification of PPGs in the original set of samples was a result of sample handling or laboratory contamination.

Non-target Organic Chemicals

Initial analyses by the NJDEP laboratory, using an analytic method designed for pesticides (USEPA Method 507), indicated the presence of a non-target compound that could not be tentatively identified, particularly in the April 4, 1996 sample from well 26 at the Parkway well field. Subsequent analyses by laboratories of the NJDEP, NJDHSS, USEPA (in Cincinnati, Athens, and Las Vegas) and Union Carbide confirmed the presence of an unknown compound (Richardson et al., 1999). The USEPA Las Vegas laboratory determined the probable structure of the unknown substance, which was consistent with a chemical by-product known to be present in Union Carbide production wastes deposited at the Reich Farm Superfund site in 1971. This substance has been identified as a mixture of isomers of 4-cyano-1,2,3,4-tetrahydro-"-methyl-naphthalene-acetonitrile (THNA) and 4-cyano-1,2,3,4-tetrahydro-1-naphthalene-propionitrile (THNP). Because these closely related compounds are formed as condensation by-products of the styrene-acrylonitrile co-polymerization process and are composed of one part styrene and two parts acrylonitrile, they are collectively referred to as *styrene-acrylonitrile (SAN) trimer*.

The concentration of SAN trimer in Parkway well 26 has ranged between approximately 3 and 5 µg/l, with concentrations tending slightly lower with time (Table 7c). Lesser amounts have been found in wells 28 (approximately 0.1 µg/l) and, in the summer of 1998, in well 29 (Tables 7b and 7c). The level of trimer is estimated to have been approximately 6 µg/l in well 26 in April 1996, although the analytical method was not designed to quantify the amount present. Diluted levels of trimer were present at the Parkway point of entry and in distribution system (school) sample points (at an estimated level of 1 µg/l or below) in the late March and early April 1996 samples. Based on a detailed review of chromatographs from Parkway well analyses conducted in 1990 by Radian Laboratories for Union Carbide and USEPA, NJDEP staff concluded that SAN trimer was present in samples taken at that time.

Upon discovery of SAN trimer in November 1996, the Parkway well field was voluntarily closed by UWTR in response to requests from NJDEP and NJDHSS. A granular activated carbon (GAC) treatment system was designed and constructed for wells 26 and 28 by May 1997. Treated output from these wells is generally discharged to the ground, but may be directed into the distribution system during periods of exceptionally high water demand. In May 1997, the remaining wells in the Parkway well field were restored to service, and the NJDEP and the NJDHSS instituted a program of frequent monitoring of the wells and point of entry. From early July to early September 1998, traces of SAN trimer were detected in well 29 (less than the method detection level of 0.1 µg/l), but not at the Parkway point of entry. As described above for TCE, this contamination episode is thought to be related to over-pumping of well 29 relative to wells 26 and

28. SAN trimer may also have been present in a well 29 sample in February 1999. UWTR installed additional GAC treatment at the Parkway well field for wells 22 and 29, beginning in June 1999.

After the analytical method was modified to include SAN trimer as a target analyte, all wells in the UWTR system were sampled or re-sampled. No SAN trimer was detected in any wells other than 26, 28 and 29 at the Parkway well field.

At the time of its identification in the UWTR system, nothing was known of the toxicity of SAN trimer. Since that time, Union Carbide has sponsored genetic toxicology assays and short-term toxicity testing. This testing revealed that SAN trimer was mutagenic in two of five strains of *Salmonella* bacteria and that it induced chromosomal aberrations in Chinese hamster ovary cells, but there was no evidence of mutagenicity in two other assays. The lethal single dose was estimated to be 440 and 590 mg/kg in male and female rats. A two-week repeat dosing study showed that daily doses of 300 mg/kg were lethal to rats, while doses of 150 mg/kg resulted in a variety of toxic effects including lethargy, tremors, anemia, and increased liver weight. There was no apparent short-term toxicity at repeated doses of 75 mg/kg. Plans for further toxicological testing are being coordinated by the USEPA and a working group of scientists from the National Institute of Environmental Health Sciences, ATSDR, NJDEP and NJDHSS, with input from Union Carbide and a consultant to the Ocean County Health Department.

The NJDEP has formed a committee to evaluate the possible presence of other non-target chemicals, particularly in relation to the Reich Farm groundwater contamination plume. A preliminary evaluation indicates that the following chemicals may be present in the groundwater plume: tetrachlorophthalic anhydride; chlorendic anhydride; chlorostyrene; dichlorostyrene; bis(4-chlorophenyl) sulfone; triallyl isocyanurate; diphenylhydrazine picrate or diphenyl amine; N-ethyl- and N-methyl-p-toluenesulfonamide; and SAN dimers. Other possible chemicals are being investigated. The NJDEP committee is expected to issue a report of their findings, separate from this Public Health Consultation. The NJDEP is also carrying out research projects to examine the application of expanded testing methods in other drinking water supplies in the State.

Inorganic Chemicals

In general, levels of inorganic chemicals in the UWTR system and in the comparison samples are typical of groundwater-based community water systems (Tables 8a, 8b and 8c). In the school distribution system samples in March 1996, “first draw” water samples from seven of the schools reached or exceeded the USEPA Action Level of 20 µg/l for *lead* (range 20 to 1,930 µg/l). One first draw water sample exceeded the Action Level of 1,300 µg/l for *copper* (7,130 µg/l). In every case where first draw lead or copper levels were elevated, the corresponding "flushed" level was well below drinking water guidance levels. That is, allowing the water to run through the lines for several minutes resulted in the flushing away of lead and/or copper built up in the water from the building plumbing.

One well water sample contained 80 µg/l of lead (Berkeley well 33) in April 1996. However, the Berkeley point of entry sample corresponding to this well had no detectable levels of lead, and nearby distribution samples did not contain elevated levels of lead. Two follow-up samples collected at this well showed lead levels at about 10 µg/l. Copper levels in all the point of entry and well water samples were well below the action level.

Lead can have adverse effects on the neurologic development of children (CDC, 1991). The USEPA has established a drinking water action level for community water supplies of 15 µg/l (based on the 90^{th} percentile of first draw samples taken at representative taps within the system) and a guidance level of 20 µg/l for school drinking water fountains. The action level for copper is based on acute gastrointestinal effects.

Nickel was detected at low levels (< 10 µg/l) in several water samples from the distribution system, points of entry and wells. Its presence may be attributable to low levels in the source waters as well as to corrosion of pipes and plumbing. There is no current MCL for nickel, although a previous federal standard was 100 µg/l.

The detection of lead and copper in the distribution system (school) samples is largely due to corrosion-related rather than source-related influences. Groundwater in Ocean County (and in southern New Jersey in general) is naturally corrosive; that is, it is slightly acidic with low mineral content and, if untreated, tends to dissolve metals from pipes and plumbing with which it is in contact. Although UWTR adds lime to adjust the pH and reduce corrosiveness of the water, corrosion of distribution system plumbing and individual building plumbing can still result in the leaching of metals into drinking water.

Barium was detected at some level in all the samples from the distribution system (schools), points of entry and wells, and comparison locations in the approximate range of 10 to 70 µg/l. Typical barium levels in New Jersey community water supplies using groundwater range from <1 to 3,000 µg/l (median 13 µg/l); those using surface water range from <1 to 1,320 µg/l (median 9 µg/l). The MCL for barium is 2,000 µg/l.

Mercury was detected in 17 of 21 UWTR distribution system (school) water samples, and in most of the point of entry, well and comparison samples in the range of 0.04 to 0.64 µg/l (Tables 8a, 8b and 8c). However, none exceeded the drinking water MCL of 2 µg/l. According to the data from the NJDEP Bureau of Safe Drinking Water, the median mercury level in New Jersey community water systems is less than 0.5 µg/l for groundwater supplies and 0.5 µg/l for surface water supplies. The MCL for mercury is based on prevention of kidney toxicity.

Molybdenum was detected in some of the distribution system (school) and compariosn samples at levels ranging up to 4 µg/l, and in some of the UWTR points of entry and well samples ranging up to 12 µg/l. Although there is no MCL for this metal, the levels of molybdenum in these samples were below the USEPA lifetime health advisory for molybdenum in drinking water of 40 µg/l.

No *chromium, cadmium, arsenic, antimony, beryllium, selenium, thallium* or *tin* were found (at detection limits of 1 or 2 µg/l) in any of the UWTR distribution system (school) samples (Table 8a). These metals were either not detected or found near the detection limits of 1 or 2 µg/l in point of entry or well samples, in all cases well below MCLs. *Arsenic, selenium, chromium and cadmium* were measured at just above method detection limits in a few well or point of entry samples, in all cases well below MCLs (Table 8b). Chromium was measured at 37 µg/l in one of the comparison wells, a level which is below the MCL of 100 µg/l (Table 8c).

Asbestos was not detected in any of the distribution (school) or comparison (school) water samples, nor in the new wells (43, 44 and 45) that came on line during the period of testing. Asbestos could occur in drinking water through the action of acidic water on asbestos-cement distribution system pipes. The NJDHSS Laboratory's detection limit was 0.02 or 0.03 million fibers per liter; the MCL for asbestos fibers is 7 million fibers (over 10 microns in length) per liter.

Nitrate and nitrite were tested in most of the UWTR wells and points of entry. Total nitrate plus nitrite levels ranged from 0.06 to 2.4 milligrams per liter (mg/l). The MCL for nitrate plus nitrite is 10 mg/l.

Radiological Activity

None of the distribution system (school) water samples from March 1996 exceeded the MCL for gross alpha activity of 15 pCi/l or the gross beta activity trigger level of 50 pCi/l (Table 9a). However, 13 schools exceeded a gross alpha level of 5 pCi/l (taking into account possible measurement error). This level triggers a regulatory analysis for radium-226 and radium-228. Estimates of combined radium (226 plus 228) activity in these samples were all less than the MCL of 5 pCi/l. Four points of entry sampled in April 1996 (Route 70, Indian Head, Berkeley, and Parkway) reached or exceeded the MCL for gross alpha activity (Table 9b). The Route 70 and Indian Head points of entry approached or exceeded the combined radium drinking water standard of 5 pCi/l in those and subsequent samples (Table 9b). In response to these findings, UWTR voluntarily reduced use of well #20 at the Indian Head point of entry beginning in the summer of 1996. Measurements from distribution system samples (hydrants) taken in July 1996 near the Berkeley and Route 70 points of entry showed relatively high gross alpha and combined radium activity (Table 9a). As the Holly, Brookside, and Windsor points of entry came on line in 1996, gross alpha activity was found to be low (Table 9b).

Subsequent quarterly sampling in 1996 and 1997 showed a consistent pattern of relatively higher gross alpha levels at points of entry in which Kirkwood-Cohansey wells provided a major proportion of water (Route 70, Berkeley, and Parkway). Wells in the Piney Point aquifer (well 37 at Holly, wells 15 and 43 at Brookside, wells 39 and 41 at Parkway, and well 40 at Windsor) and the deeper Potomac-Raritan-Magothy aquifer (well 30 at Holly, wells 42 and 45 at Parkway) generally showed lower levels of gross alpha activity than the shallower wells tapping the Kirkwood-Cohansey aquifer.

The measurements of gross alpha activity were significantly higher than those found in historic compliance monitoring of the UWTR system. Furthermore, the combined radium-226 and radium-228 levels accounted for a smaller fraction of alpha activity than expected. Laboratory analysts noted that re-analyses of samples showed lower levels, and that samples analyzed close to collection time had the highest alpha activity. Upon further study, NJDEP and NJDHSS determined that there was a short-lived alpha particle emitter, radium-224, that was contributing to the high gross alpha activities (Parsa, 1998). Since routine radiological testing typically involves long sample holding times before analysis, radium-224, whose half-life is approximately 3.5 days, decays before testing. This finding has led the NJDEP to re-examine required procedures for the collection and analysis of samples for radiological activity from community water supplies.

With the U.S. Geological Survey, NJDEP has been studying the occurrence of gross alpha activity and radium species throughout New Jersey. Studies of the distribution of radium-226 and -228 (and more recent data of gross alpha activity using short holding times) indicate that radiological activity attributable to radium species is a problem that is not confined to the Dover Township area. Instead, it appears that radium-related activity is elevated throughout the shallower aquifer systems of southern New Jersey and in parts of northern New Jersey (NJDEP, 1997).

Two wells and their corresponding point of entry were selected for detailed time-series monitoring for gross alpha activity in order to determine time variability over the course of a day and a week (Table 9d). The results show that the gross alpha activity levels were relatively stable over a day and a week.

Radiological activity results for the comparison samples are found in Table 9e. One of the four comparison wells samples exceeded the gross alpha activity trigger level of 5 pCi/l. Radiological activity was very low in the commercial bottled water sample.

Radium exposure has been associated with increased risk of bone and paranasal sinus cancers in highly exposed workers (NRC, 1988; NRC, 1990). Few epidemiologic studies have examined the risk of childhood cancers with respect to radium in drinking water. Radium in drinking water has been associated with increased bone cancer incidence in adolescents (Finkelstein and Krieger, 1996) and with leukemia incidence in adults but not children (Lyman et al., 1985). The epidemiologic evidence is insufficient to draw conclusions regarding the risk from radium in drinking water.

Uranium activity (for three isotopes: U-238, U-235, and U-234) was measured in April 1996 samples from the Indian Head point of entry and well 20, the Route 70 point of entry and well 31, and the Berkeley and Parkway points of entry (Table 9c). Combined uranium ranged from not detectable up to 1.5 pCi/l. Combined *thorium* activity (for three isotopes: Th-228, Th-230 and Th-232) was measured at 0.2 pCi/l in a sample from well 20. There are no MCLs for thorium or uranium activity.

Radon test results from the Parkway point of entry and wells, the Windsor and Brookside points of entry, and wells at South Toms River and Berkeley ranged from 80 ± 10 to 410 ± 50 pCi/l. Normal ranges of radon gas in groundwater in southern New Jersey are generally in this range or higher. A USEPA proposed MCL of 300 pCi/L for radon in drinking water was published in 1991, but has not been finalized because of the relatively modest role that radon from drinking water has relative to overall radon exposure. Radon gas exposure at high levels in underground mines is associated with increased risk of lung cancer; epidemiologic studies of radon exposure at the lower levels found in the indoor air of some homes (from radon gas infiltration of basements) also suggest an increase risk of lung cancer (Lubin and Boice, 1997; NRC, 1998; NRC, 1988). No association was found between exposure to radon in indoor air and risk of childhood cancers (Lubin et al., 1998).

Gamma spectroscopy scans of samples from the South Toms River and Route 70 points of entry and wells revealed no evidence of contamination by gamma-emitting radionuclides generated by human activities.

Conclusions

As part of an investigation of the incidence of childhood cancer in Dover Township, Ocean County coordinated by the New Jersey Department of Health and Senior Services (NJDHSS) and the federal Agency for Toxic Substances and Disease Registry (ATSDR), the NJDHSS and the New Jersey Department of Environmental Protection (NJDEP) have evaluated the quality of water served by the community water supply. A thorough chemical and radiological analysis has been conducted on samples from the water distribution system, the eight points of entry, and over 20 wells. NJDHSS, NJDEP, and ATSDR have concluded the following:

* In this investigation, a previously unidentified contaminant was discovered in Parkway well water samples in varying estimated concentrations, the highest levels being found in well 26. The unknown material was identified in November 1996 as isomers of THNA and THNP, collectively known as styrene-acrylonitrile (SAN) trimer. The SAN trimer is now known to be an unintended by-product resulting from the synthesis of styrene-acrylonitrile co-polymer. The presence of SAN trimer is attributable to the Reich Farm waste site groundwater contamination plume. The time of initial contamination is not known, nor are historic concentrations known. There is evidence of SAN trimer in the distribution system in March 1996 at levels of approximately 1 µg/l.

  Exposure to SAN trimer was interrupted in November 1996 by temporary voluntary closure of the Parkway well field. By May 1997, activated carbon treatment of wells 26 and 28 was installed and treated water was discharged to the ground. (However, treated output from these wells may be pumped into the distribution system in times of high water demand.) Because of sporadic detection of SAN trimer in well 29, activated carbon treatment was installed for this well and for well 22 in June 1999, interrupting the potential exposure pathway.

  The public health implications of SAN trimer contamination cannot yet be assessed. The toxicity testing of the SAN trimer, coordinated by the USEPA, will assist in making this determination.

* Low levels of trichloroethylene were found in certain wells of the Parkway well field as early as 1986. The installation of a packed tower aeration treatment system at two wells (26 and 28) in 1988 served to reduce exposure to TCE, although TCE detections continued to occur due to sporadic contamination of an untreated well (#29). Subsequent activated carbon treatment of well 29 should interrupt exposure to TCE through this well. TCE is a common industrial solvent and has been a frequent drinking water contaminant in New Jersey and the U.S., often at levels many times higher than what was found in the UWTR system. TCE is classified as a probable human carcinogen based on animal and

human worker studies. While epidemiologic studies suggest an increased risk of leukemias and/or lymphomas from exposure to TCE-contaminated drinking water, they are not considered conclusive.

* Gross alpha radiological activity is elevated in water provided by some of the points of entry into the UWTR system, particularly those in which a large proportion of water comes from the shallow Kirkwood-Cohansey aquifer. According to the NJDEP and the U.S. Geological Survey, the problem of relatively high gross alpha activity attributable to radium species is not confined to the Dover Township area. Rather, there appears to be a general elevation in radium-related activity throughout the shallower aquifer systems of southern New Jersey. Occupational radium exposure has been associated with increased risk of bone and paranasal sinus cancers in highly exposed workers. Radium in drinking water has been associated with increased bone cancer incidence in adolescents and with leukemia incidence in adults but not children, but the epidemiologic evidence is inconclusive.

* At some schools, elevated lead and copper were found in first-draw samples but not in flushed samples, indicating corrosion of metals from building plumbing. Corrosion is a problem common to many community water systems. Since 1989, federal and State agencies have recommended that all schools establish routine flushing programs to reduce exposure to these metals in drinking water. Exposure to accumulated lead can have adverse effects on the neurologic development of children. High levels of copper in drinking water may result in acute gastrointestinal effects.

* Although the UWTR system appears typical in most respects, the presence of an unusual chemical at the Parkway well field, a sign of impact from the Reich Farm groundwater contamination plume, appears to be a characteristic unique to the area. Although little is known of the toxicologic implications of this impact, it is reasonable to consider exposure to this water source in epidemiologic investigations of childhood cancer in Dover Township.

Recommendations

Exposure Reduction Recommendations

Treatment of the Parkway wells impacted by the Reich Farm groundwater contamination should be continued until such time that the plume no longer threatens the wells. The treatment should include methods to remove volatile and semi-volatile organic chemicals, such as packed tower aeration and/or granular activated carbon. Monitoring (at appropriate intervals) of the effectiveness of treatment systems is necessary to ensure that Reich Farm-related contaminants are not introduced into the distribution system of the community water supply.

When reduction of exposure to naturally occurring radiological activity in drinking water is necessary to meet applicable standards, use of wells with higher gross alpha activity should be minimized when possible.

To reduce exposure to lead from plumbing, particularly in those schools where lead and copper levels in first draw samples were elevated, the NJDHSS and NJDEP recommend that schools adopt a flushing program. This entails running the drinking water fountains each morning for a minute or two. In addition, schools may choose to provide a supplemental source of bottled water.

Water System and Source Water Characterization Recommendations

NJDEP and USEPA should continue to monitor the extent and movement of known contamination plumes in Dover Township, including those associated with the Reich Farm and Ciba-Geigy Superfund sites. Remedial efforts to contain and remove pollutants should be maintained to ensure the quality of future water supplies.

NJDEP should continue its evaluation of the potential existence of additional, non-target chemicals in the Reich Farm plume.

NJDEP and the U.S. Geological Survey should continue to conduct research into the occurrence and dynamics of radiological contaminants in the Kirkwood-Cohansey aquifer of southern New Jersey.

Other Public Health Recommendations

NJDHSS should continue to consider access to water from specific points of entry in the UWTR system in its "Case-control Study of Childhood Cancer in Dover Township (Ocean County), New Jersey," using computer-modeled, historical re-constructions of the UWTR system under development by ATSDR.

USEPA should continue efforts to characterize the toxicology of SAN trimer, including attention to possible carcinogenicity following pre-natal or early post-natal exposure.

NJDEP and USEPA should re-evaluate regulations governing sample collection, holding time and analysis for gross alpha and radium activity.

Where hazardous waste sites threaten water supplies, NJDEP and USEPA should consider expanded testing to encompass pollutant classes of local importance.

Public Health Action Plan

The Public Health Action Plan (PHAP) is a description of actions to be taken by ATSDR and/or NJDHSS. The purpose of the PHAP is to ensure that a Public Health Consultation not only identifies public health hazards, but provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. Included is a commitment on the part of ATSDR and NJDHSS to monitor this plan to ensure that the plan is implemented. The public health actions to be implemented by ATSDR and NJDHSS are as follows:

Actions Undertaken

1) The NJDHSS, NJDEP and ATSDR implemented a program of extensive sampling and testing of the UWTR community water supply beginning in 1996.

2) Testing led to the discovery of a previously uncharacterized contaminant (SAN trimer). This discovery prompted efforts on the part of NJDEP, USEPA, and UWTR to interrupt the exposure pathway through the voluntary closure of the Parkway well field in November 1996 and later (May 1997) installation of GAC treatment of wells 26 and 28. GAC treatment was extended to wells 29 and well 22 to protect against sporadic or potential contamination from the Reich Farm plume.

3) Sampling and testing also led to the recognition of a regional problem of naturally-occurring radium contamination, and a need for improvement in the standard methods for collecting and handling specimens for radiological analyses. This discovery led to the voluntary reduction in use of certain wells in the UWTR system to reduce overall exposure to radium.

Actions Planned

1) The ATSDR and the NJDHSS will continue to evaluate water quality data associated with the Parkway well field for public health significance, and recommend or take appropriate mitigative public health actions as needed.

2) In cooperation with the USEPA, the NIEHS and the NJDEP, the NJDHSS and the ATSDR will review the public health implications of exposure to the SAN trimer as relevant toxicological data become available.

3) The NJDHSS and ATSDR will assess exposure to specific drinking water sources in the on-going epidemiologic study of childhood cancers in Dover Township.

4) The NJDHSS will work with NJDEP to promote tap water flushing programs in schools, to reduce overall exposures to lead.

5) The ATSDR and NJDHSS will reevaluate and revise this Public Health Action Plan as warranted, should new environmental, toxicological or other information indicate the need for additional actions.

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Certification

This Public Health Consultation was prepared by the New Jersey Department of Health and Senior Services and the New Jersey Department of Environmental Protection, under a cooperative agreement between NJDHSS and the Agency for Toxic Substances and Disease Registry (ATSDR). It has been prepared in accordance with approved methodology and procedures existing at the time the Public Health Consultation was begun.

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The Division of Health Assessment and Consultation, ATSDR, has reviewed this Public Health Consultation and concurs with its findings.

Richard E. Gillig
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References

ATSDR, 1998a. Toxicological profile for chloroform. U.S. Agency for Toxic Substances and Disease Registry, Atlanta, Ga.

ATSDR, 1998b. Toxicological profile for methyl-tert-butyl ether. U.S. Agency for Toxic Substances and Disease Registry, Atlanta, Ga.

ATSDR, 1997a. Toxicological profile for trichloroethylene. U.S. Agency for Toxic Substances and Disease Registry, Atlanta, Ga.

ATSDR, 1997b. Volatile Organic Compounds in Drinking Water and Adverse Pregnancy Outcomes, Interim Report, United States Marine Corps Base, Camp LeJeune, North Carolina. U.S. Agency for Toxic Substances and Disease Registry, Atlanta, Ga.

ATSDR, 1996. Toxicological profile for tetrachloroethylene. U.S. Agency for Toxic Substances and Disease Registry, Atlanta, Ga.

ATSDR, 1995a. Toxicological profile for 1,1,1-trichloroethane. U.S. Agency for Toxic Substances and Disease Registry, Atlanta, Ga.

ATSDR, 1995b. Toxicological profile for naphthalene. U.S. Agency for Toxic Substances and Disease Registry, Atlanta, Ga.

ATSDR, 1994. Toxicological profile for 1,2-dichloroethane. U.S. Agency for Toxic Substances and Disease Registry, Atlanta, Ga.

ATSDR, 1993. National Exposure Registry, Trichloroethylene (TCE) Subregistry, Baseline Technical Report. U.S. Agency for Toxic Substances and Disease Registry, Atlanta, Ga.

ATSDR, 1991. Toxicological profile for bromoform and chlorodibromomethane. U.S. Agency for Toxic Substances and Disease Registry, Atlanta, Ga.

ATSDR, 1989. Toxicological profile for bromodichloromethane. U.S. Agency for Toxic Substances and Disease Registry, Atlanta, Ga.

Bove FJ, Fulcomer MC, Klotz JB, Esmart J, Dufficy EM, and Savrin JE, 1995. Public drinking water contamination and birth outcomes. Am J Epidemiol 141:850-862.

Cantor K, 1997. Drinking water and cancer. Cancer Causes and Control 8:292-308.

CDC, 1991. Preventing Lead Poisoning in Young Children. U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, Atlanta, Ga.

Cohn P, Bove F, Klotz J, Berkowitz M, Fagliano J, 1994. Drinking water contamination and the incidence of leukemia and non-Hodgkin's lymphoma. Environ Health Perspec 102:556-61.

Cohn P, Savrin J, and Fagliano J, 1999. Mapping of volatile organic chemicals in New Jersey water systems. J Exposure Analysis Environ Epidemiol 9:171-180.

Ebasco, 1988. Final Draft Supplemental Remedial Investigation Report, Reich Farm Site, Dover Township, Ocean County, N.J. Ebasco Corporation, Lyndhurst, N.J.

Finkelstein MM and Krieger N, 1996. Radium in drinking water and risk of bone cancer in Ontario youths: a second study and combined analysis. Occup Environ Med 53:305-311.

IARC, 1995. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Volume 63: Dry Cleaning, Some Chlorinated Solvents and Other Industrial Chemicals. International Agency for Research on Cancer, Lyons.

IARC, 1991. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Volume 52: Chlorinated Drinking Water; Chlorination By-products; Some Other Halogenated Compounds; Cobalt and Cobalt Compounds. International Agency for Research on Cancer, Lyons.

Klotz JB and Pyrch LP, 1999. Neural tube defects and drinking water disinfection by-products. Epidemiology 10:383-390.

Lagakos SW, Wessen BJ, Zelen M, 1986. An analysis of contaminated well water and health effects in Woburn, Massachusetts. J Am Stat Assoc 81:583-596.

Lubin JH and Boice JD, 1997. Lung cancer risk from residential radon: meta-analysis of eight epidemiologic studies. J Natl Cancer Inst 89:49-57.

Lubin JH, Linet MS, Boice JD, Buckley J, Conrath SM, Hatch EE, Kleinerman RA, Tarone RE, Wacholder S, and Robison LL, 1998. Case-control study of childhood acute lymphoblastic leukemia and residential radon exposure. J Natl Cancer Inst 90:294-300.

Lyman GH, Lyman CG, Johnson W, 1985. Association of leukemia with radium groundwater contamination. JAMA 254:621-626.

MDPH, 1997. Woburn Childhood Leukemia Follow-up Study (Final Report). Bureau of

Environmental Health Assessment, Massachusetts Department of Public Health, Boston, Ma.

Morris RD, Audet A-M, Angelillo IF, Chalmers TC, Mosteller F, 1992. Chlorination, chlorination by-products, and cancer: a meta-analysis. Am J Public Health 82:955-963.

NJDEP, 1997. A Homeowner's Guide to Radioactivity in Drinking Water. New Jersey Department of Environmental Protection, Trenton, N.J.

NJDEP, 1987. Results of Testing for Hazardous Contaminants in Public Water Supplies Under Assembly Bill A-280. Office of Science and Research and Bureau of Safe Drinking Water, New Jersey Department of Environmental Protection, Trenton, N.J.

NJDHSS, 1997. Childhood Cancer Incidence Health Consultation: A Review and Analysis of Cancer Registry Data, 1979-1995, for Dover Township (Ocean County), New Jersey. New Jersey Department of Health and Senior Services, Trenton, N.J.

NJDHSS, 1996-1999. Analytical Data Report Packages, Volumes 1 - 184. Public Health and Environmental Laboratories, New Jersey Department of Health and Senior Services, Trenton, N.J.

NJDHSS and ATSDR, 1999. Public Health Assessment: Reich Farm, Dover Township, Ocean County, New Jersey (Draft for Public Comment). New Jersey Department of Health and Senior Services (Trenton, N.J.), and U.S. Agency for Toxic Substances and Disease Registry (Atlanta, Ga.).

NJDHSS and ATSDR, 1996. Dover Township Childhood Cancer Investigation, Public Health Response Plan. New Jersey Department of Health and Senior Services (Trenton, N.J.), and U.S. Agency for Toxic Substances and Disease Registry (Atlanta, Ga.).

NRC, 1998. Biological Effects of Ionizing Radiation, VI. Health Effects of Exposure to Radon. National Research Council, National Academy of Sciences, National Academy Press, Washington, D.C.

NRC, 1990. Biological Effects of Ionizing Radiation, V. Health Effects of Exposure to Low Levels of Ionizing Radiation. National Research Council, National Academy of Sciences, National Academy Press, Washington, D.C.

NRC, 1988. Biological Effects of Ionizing Radiation, IV. Health Risks of Radon and Other Internally Deposited Alpha-Emitters. National Research Council, National Academy of Sciences, National Academy Press, Washington, D.C.

NUS, 1986. Remedial Investigation, Reich Farm Site, Pleasant Plains, Dover Township, New

Jersey. NUS Corp., Pittsburgh, Pa.

Parsa B, 1998. Contribution of short-lived radionuclides to alpha-particle radioactivity in drinking water and their impact on the safe drinking water act regulations. Radioactivity and Radiochemistry 9 (7).

Richardson SD, Collette TW, Price PC, Genicola FA, Jenks JW, Thruston AD Jr, Ellington JJ, 1999. Identification of drinking water contaminants in the course of a childhood cancer investigation in Toms River, New Jersey. J Exposure Analysis Environ Epidemiol 9:200-216.

Swan SH, Waller K, Hopkins B, Windham G, Fenster L, Schaefer C, Neutra RR, 1998. A prospective study of spontaneous abortion: relation to amount and source of drinking water consumed in early pregnancy. Epidemiology 9:126-133.

Tables and Figures

Please note: The figures could not be added to the electronic version of this document. A complete, printed copy of this Public Health Consultation may be obtained by calling the New Jersey Department of Health and Senior Services at (609) 633-2043.

Table 1. Characteristics of United Water Toms River (UWTR) wells in operation since the 1960s, by point of entry.

Well Number	Years in Operation	Aquifer	Depth (feet)	Pumping Capacity (gal/min)
Holly (Point of entry 1)				
13	1946 - 1967	Kirkwood-Cohansey	61	NA
14	1953 - 1983	Kirkwood-Cohansey	50	NA
16	1965 - 1989	Piney Point	226	800
18	1965 - 1983	Kirkwood-Cohansey	59	NA
19	1967 - 1983	Kirkwood-Cohansey	62	NA
21	1969 -	Kirkwood-Cohansey	56	700
30	1981 -	Potomac/Raritan/Magothy	1875	2100
37	1989 -	Piney Point	234	800
Brookside (Point of entry 2)				
15	1960 -	Piney Point	230	700
43	1997 -	Piney Point	258	1400
South Toms River (Point of entry 3)				
17	1966 - 1988	Kirkwood-Cohansey	59	700
32	1979 -	Kirkwood-Cohansey	49	700
38	1988 -	Kirkwood-Cohansey	66	700
Indian Head (Point of entry 4)				
20	1967 -	Kirkwood-Cohansey	87	500
Route 70 (Point of entry 5)				
31	1979 -	Kirkwood-Cohansey	102	700
Berkeley (Point of entry 6)				
33	1986 -	Kirkwood-Cohansey	102	1000
34	1985 -	Kirkwood-Cohansey	105	1000
35	1988 -	Kirkwood-Cohansey	105	1000

Well Number	Years in Operation	Aquifer	Depth (feet)	Pumping Capacity (gal/min)
Parkway (Point of entry 7)				
22	1971 -	Kirkwood-Cohansey	126	700
23	1971 - 1992	Piney Point	274	300
24	1971 -	Kirkwood-Cohansey	125	700
25	1971 - 1989	Piney Point	283	700
26	1971 -	Kirkwood-Cohansey	133	700
27	1971 - 1989	Piney Point	291	700
28	1975 -	Kirkwood-Cohansey	125	700
29	1975 -	Kirkwood-Cohansey	135	700
39	1990 -	Piney Point	288	450
41	1992 -	Piney Point	274	250
42	1994	Potomac/Raritan/Magothy	1337	1250
44	1996 -	Kirkwood-Cohansey	106	540
45	1998 -	Potomac/Raritan/Magothy	1336	1200
Windsor (Point of entry 12)				
40	1993 -	Piney Point	318	1900
Other Points of Entry				
Anchorage	1966 - 1985	Piney Point	234	NA
Silver Bay	1966 - 1985	Piney Point	237	NA

NA = Data not available

Table 2. Current State and federal primary drinking water standards for chemicals and radiological activity, and UWTR compliance history before 1996.

Contaminant	Maximum Contaminant Level (MCL) in 1996	Baseline Sampling Frequency for UWTR **	Compliance History of UWTR Before 1996
Volatile Organic Chemicals (MCLs in micrograms per liter)			
benzene	1	points of entry sampled quarterly, every 3 years	in compliance
carbon tetrachloride	2		in compliance
m-dichlorobenzene	600		in compliance
o-dichlorobenzene	600		in compliance
p-dichlorobenzene	75		in compliance
1,2-dichloroethane	2		in compliance
1,1-dichloroethylene	2		in compliance
cis-1,2-dichloroethylene	10*		in compliance
trans-1,2-dichloroethylene	10*		in compliance
1,2-dichloropropane	5		in compliance
ethylbenzene	700		in compliance
methylene chloride	2*		in compliance
chlorobenzene	4*		in compliance
styrene	100		in compliance
tetrachloroethylene	1		in compliance
toluene	1000		in compliance
1,2,4-trichlorobenzene	8*		in compliance
1,1,1-trichloroethane	26*		in compliance
1,1,2-trichloroethane	5*		in compliance
trichloroethylene	1		currently in compliance; detected in wells 26, 28 and 29 at the Parkway well field in 1987; air stripping treatment installed in 1988

Contaminant	Maximum Contaminant Level (MCL) in 1996	Baseline Sampling Frequency for UWTR **	Compliance History of UWTR Before 1996
vinyl chloride	2		in compliance
xylenes (total)	44*		in compliance
trihalomethanes (total of chloroform, bromodichloromethane, dibromochloromethane, bromoform)	100	4 distribution system samples per quarter	in compliance
Other Organic Chemicals (MCLs in micrograms per liter)			
alachlor	2	points of entry sampled quarterly, every 3 years	in compliance
aldicarb	monitor		in compliance
aldicarb sulfone	monitor		in compliance
aldicarb sulfoxide	monitor		in compliance
atrazine	3		in compliance
benzo(a)pyrene	0.2		in compliance
carbofuran	40		in compliance
chlordane	0.5		in compliance
dalapon	200		in compliance
dibromochloropropane (DBCP)	0.2		in compliance
di(2-ethylhexyl)adipate	400		in compliance
di(2-ethylhexyl)phthalate	6		in compliance
dinoseb	7		in compliance
diquat	20		in compliance
endothall	100		in compliance
endrin	2		in compliance
ethylene dibromide (EDB)	0.05		in compliance
glyphosate	700		in compliance
heptachlor	0.4		in compliance

Contaminant	Maximum Contaminant Level (MCL) in 1996	Baseline Sampling Frequency for UWTR **	Compliance History of UWTR Before 1996
heptachlor epoxide	0.2		in compliance
hexachlorobenzene	1		in compliance
hexachlorocyclopentadiene	50		in compliance
lindane	0.2		in compliance
methoxychlor	40		in compliance
oxamyl	200		in compliance
PCBs (total)	0.5		in compliance
pentachlorophenol	1		in compliance
picloram	500		in compliance
simazine	4		in compliance
toxaphene	3		in compliance
2,3,7,8-TCDD (dioxin)	0.00003		in compliance
2,4-D	70		in compliance
2,4,5-TP (silvex)	50		in compliance
Inorganic Chemicals (MCLs in micrograms per liter unless otherwise noted)			
antimony	6	points of entry sampled every 3 years	in compliance
arsenic	50		in compliance
asbestos	7 (million fibers/liter)	distribution system sampled every 9 years	in compliance; UWTR granted testing waiver based on low corrosivity of water
barium	2000	points of entry sampled every 3 years	in compliance
beryllium	4		in compliance
cadmium	5		in compliance
chromium	100		in compliance
copper	1300 (action level)	distribution system sampled every 6 months	in compliance; corrosion control treatment in operation

Contaminant	Maximum Contaminant Level (MCL) in 1996	Baseline Sampling Frequency for UWTR **	Compliance History of UWTR Before 1996
cyanide	200	points of entry sampled every 3 years	in compliance
fluoride	4000		in compliance
lead	15 (action level)	distribution system sampled every 6 months	in compliance; corrosion control treatment in operation
mercury	2	points of entry sampled every 3 years	in compliance
nickel	100*		in compliance
nitrate (as nitrogen)	10000	points of entry sampled every year	in compliance
nitrite (as nitrogen)	1000	points of entry sampled every 3 years	in compliance
selenium	50		in compliance
thallium	2		in compliance
Radiological Activity (MCLs in picocuries per liter unless otherwise noted)			
gross alpha activity	15	distribution system sampled every four years	in compliance
gross beta activity	4 mrem/yr		in compliance
combined radium (226+228)	5		in compliance

* In late 1996, standards were changed for these chemicals to: cis-1,2-dichloroethylene =70 µg/l; trans-1,2-dichloroethylene = 100 µg/l; methylene chloride = 3 µg/l; chlorobenzene = 50 µg/l; 1,2,4-trichlorobenzene = 9 µg/l; 1,1,1-trichloroethane = 30 µg/l; 1,1,2-trichloroethane = 3 µg/l; xylenes = 1000 µg/l; and nickel = monitor, no MCL.

** Sampling frequency requirements may be waived or reduced for some contaminants. For details, contact the NJDEP Bureau of Safe Drinking Water at (609) 292-5550.

Note: In late 1996, new MCLs were established for: 1,1-dichloroethane = 50 µg/l; methyl tertiary butyl ether (MTBE) = 70 µg/l; naphthalene = 300 µg/l; and 1,1,2,2-tetrachloroethane = 1 µg/l.

Table 3. Sample locations, sampling dates and analytical methods, United Water Toms River (UWTR) community water supply, March 1996 through December 1998.

SAMPLE LOCATION	Inorganics	Volatile Organics	Semivolatile Organics	Semivolatile Organics	Pesticides	Other Organics	Radiological Activity
METHODS	Various	524.2	525.2	625	504, 505, 507, 515, and/or 531	LC-MS	Various
UWTR Distribution System Samples							
Toms River High School East	3/28/96	3/28/96	3/28/96		3/28/96	3/28/96	3/28/96
Toms River High School North	3/28/96	3/28/96	3/28/96		3/28/96	3/28/96	3/28/96
Toms River High School South	3/28/96	3/28/96	3/28/96 4/9/96		3/28/96	3/28/96	3/28/96
Alternate Learning Center	3/28/96	3/28/96	3/28/96		3/28/96	3/28/96	3/28/96
Toms River Intermediate East	3/28/96	3/28/96	3/28/96		3/28/96	3/28/96	3/28/96
Toms River Intermediate West	3/28/96 4/4/96	3/28/96 4/4/96	3/28/96 4/4/96		3/28/96 4/4/96	3/28/96	3/28/96
Cedar Grove Elementary	3/28/96	3/28/96	3/28/96		3/28/96 4/1/96	3/28/96	3/28/96
East Dover Elementary	3/28/96 4/4/96	3/28/96 4/4/96	3/28/96 4/4/96	4/24/96	3/28/96 4/4/96	3/28/96 8/27/96	3/28/96
Hooper Ave. Elementary	3/28/96	3/28/96	3/28/96		3/28/96	3/28/96	3/28/96
North Dover Elementary	3/28/96 3/29/96	3/28/96 3/29/96	3/28/96		3/28/96	3/28/96	3/28/96
Silver Bay Elementary	3/28/96	3/28/96	3/28/96		3/28/96	3/28/96	3/28/96
South Toms River Elementary	3/28/96	3/28/96	3/28/96		3/28/96	3/28/96	3/28/96
Walnut St. Elementary	3/28/96	3/28/96	3/28/96		3/28/96	3/28/96	3/28/96
Washington St. Elementary	3/28/96	3/28/96	3/28/96		3/28/96	3/28/96	3/28/96
West Dover Elementary	3/28/96	3/28/96	3/28/96	4/24/96	3/28/96	3/28/96 8/27/96	3/28/96

SAMPLE LOCATION	Inorganic s	Volatile Organics	Semivolatile Organics	Semivolatile Organics	Pesticides	Other Organics	Radiological Activity
METHODS	Various	524.2	525.2	625	504, 505, 507, 515, and/or 531	LC-MS	Various
Toms River Schools Admin. Bldg. – Special Ed.	3/28/96 3/29/96	3/28/96	3/28/96		3/28/96	3/28/96	3/28/96
Ambassador Christian Academy	3/28/96	3/28/96	3/28/96		3/28/96	3/28/96	3/28/96
Ocean County College	3/28/96	3/28/96	3/28/96		3/28/96	3/28/96	3/28/96
Ocean County VoTech	3/28/96	3/28/96	3/28/96		3/28/96	3/28/96	3/28/96
St. Joseph Elementary	3/28/96	3/28/96	3/28/96		3/28/96	3/28/96	3/28/96
Monsignor Donovan High School	3/28/96	3/28/96	3/28/96		3/28/96	3/28/96	3/28/96
Hydrant: Primrose & Columbine							7/11/96 7/16/97 6/9/99
Hydrant: Rte. 571 Pathmark							7/11/96 7/16/97 6/9/99
Rte. 527 Upstream of POE 5							7/1/97
Rte. 527 Downstream of POE 5							7/1/97
Hydrant: Mueller & Santiago							7/1/97
Hydrant: Santiago & Pulaski							7/1/97
UWTR Main Office							7/1/97
Rte. 37 & Fischer							7/1/97
UWTR Points of Entry and Wells							
POE 1: Holly	4/24/96	4/24/96	4/24/96	4/24/96	4/24/96		4/25/96 12/5/96 1/13/97
Well 21	8/21/96	8/21/96 12/9/96	8/21/96 12/9/96	8/21/96	8/21/96	8/21/96	9/3/96

SAMPLE LOCATION	Inorganics	Volatile Organics	Semivolatile Organics	Semivolatile Organics	Pesticides	Other Organics	Radiological Activity
METHODS	Various	524.2	525.2	625	504, 505, 507, 515, and/or 531	LC-MS	Various
Well 30		4/24/96 11/21/96	4/24/96 11/21/96		4/24/96 8/27/96*	8/27/96	
Well 37	8/21/96	8/21/96 12/9/96	8/21/96 12/9/96	8/21/96	8/21/96	8/21/96	9/3/96
POE 2: Brookside	6/17/96 7/8/96	6/17/96 7/8/96	6/17/96 7/8/96	6/17/96 7/8/96	6/17/96 7/8/96	6/17/96 7/8/96	6/17/96
Well 15	7/8/96	7/8/96 6/5/97	7/8/96 6/5/97		7/8/96	7/8/96	5/20/96 6/5/97
Well 43	4/2/97 5/15/97	4/2/97	4/2/97 4/23/97	4/2/97	5/27/97		4/2/97
POE 3: South Toms River	4/4/96 10/28/96	4/4/96	4/4/96	4/24/96	4/4/96	4/4/96	4/4/96 4/25/96 6/10/96 6/11/96 6/12/96 6/13/96 6/14/96 7/19/96 6/5/97
Well 32	4/4/96 10/28/96	4/4/96 12/9/96	4/4/96 12/9/96		4/4/96 8/27/96*	8/27/96	
Well 38	10/16/96	10/16/96 12/9/96	10/16/96 12/9/96	10/16/96	10/16/96	10/16/96	6/10/96 6/11/96 6/12/96 6/13/96 6/14/96 10/16/96
POE 4: Indian Head	4/4/96 10/28/96	4/4/96	4/4/96	4/24/96	4/4/96	4/4/96	4/4/96 4/9/96 7/10/96 7/11/96 7/12/96 7/16/97

SAMPLE LOCATION	Inorganics	Volatile Organics	Semivolatile Organics	Semivolatile Organics	Pesticides	Other Organics	Radiological Activity
METHODS	Various	524.2	525.2	625	504, 505, 507, 515, and/or 531	LC-MS	Various
Well 20	4/4/96	4/4/96 12/5/96 5/27/97 6/24/97 7/2/97 7/17/97 8/26/97 9/9/97 10/6/97 11/17/97	4/4/96 12/5/96 5/27/97 6/24/97 7/2/97 7/17/97 8/26/97 9/9/97 10/6/97 11/17/97		4/4/96		4/9/96 4/25/96 5/20/96 7/10/96 7/11/96 7/12/96 12/5/96 1/13/97 4/10/97 5/27/97 6/5/97 6/9/99
POE 5: Route 70	4/4/96 10/28/96	4/4/96	4/4/96	4/24/96	4/4/96		4/4/96 4/9/96 6/10/96 6/11/96 6/12/96 6/13/96 6/14/96 7/19/96 12/5/96 1/13/97 6/5/97 7/1/97
Well 31	4/4/96 10/28/96	4/4/96 11/21/96	4/4/96 11/21/96		4/4/96 8/27/96*	8/27/96	4/9/96 4/25/96 5/20/96 6/10/96 6/11/96 6/12/96 6/13/96 6/14/96 2/10/97 7/16/97

SAMPLE LOCATION	Inorganics	Volatile Organics	Semivolatile Organics	Semivolatile Organics	Pesticides	Other Organics	Radiological Activity
METHODS	Various	524.2	525.2	625	504, 505, 507, 515, and/or 531	LC-MS	Various
POE 6: Berkeley	4/4/96 10/28/96	4/4/96	4/4/96	4/24/96	4/4/96		4/4/96 4/25/96 7/19/96 12/5/96 1/13/97 6/5/97 7/1/97
Well 33	4/4/96 7/8/96 10/28/96	4/4/96 11/21/96	4/4/96 11/21/96		4/4/96 8/27/96*	7/8/96 8/27/96	
Well 34	10/16/96 10/28/96	10/16/96 11/21/96	10/16/96 11/21/96	10/16/96	8/27/96* 10/16/96	8/27/96 10/16/96	10/16/96
Well 35	7/8/96 10/28/96	7/8/96 11/21/96	7/8/96 11/21/96		7/8/96	7/8/96	

SAMPLE LOCATION	Inorganics	Volatile Organics	Semivolatile Organics	Semivolatile Organics	Pesticides	Other Organics	Radiological Activity
METHODS	Various	524.2	525.2	625	504, 505, 507, 515, and/or 531	LC-MS	Various
POE 7: Parkway	4/4/96 10/28/96	4/4/96 8/21/98 9/1/98 9/10/98 9/17/98 9/24/98 10/1/98 10/15/98 10/22/98 10/27/98 11/6/98 11/19/98 11/23/98 12/4/98 12/7/98 12/17/98 12/21/98 1/6/99 1/14/99 1/20/99 1/27/99 2/2/99 2/10/99 2/17/99 2/25/99 3/3/99 3/12/99 3/17/99 3/24/99 3/31/99 4/7/99 4/14/99 4/21/99 4/28/99 5/5/99 5/12/99 5/19/99 5/26/99 6/2/99	4/4/96 8/21/98 9/1/98 9/10/98 9/17/98 9/24/98 10/1/98 10/15/98 10/22/98 10/27/98 11/6/98 11/19/98 11/23/98 12/4/98 12/7/98 12/17/98 12/21/98 1/6/99 1/14/99 1/20/99 1/27/99 2/2/99 2/10/99 2/17/99 2/25/99 3/3/99 3/12/99 3/17/99 3/24/99 3/31/99 4/7/99 4/14/99 4/21/99 4/28/99 5/5/99 5/12/99 5/19/99 5/26/99 6/2/99	4/24/96	4/4/96	4/4/96	4/4/96 4/25/96 7/19/96 6/5/97 7/1/97

SAMPLE LOCATION	Inorganics	Volatile Organics	Semivolatile Organics	Semivolatile Organics	Pesticides	Other Organics	Radiological Activity
METHODS	Various	524.2	525.2	625	504, 505, 507, 515, and/or 531	LC-MS	Various
Well 22	4/4/96 10/28/96	4/4/96 5/27/97 6/24/97 7/2/97 7/17/97 7/30/97 8/14/97 8/26/97 9/9/97 10/6/97 11/17/97 12/15/97 2/4/98 2/10/98 4/1/98 7/8/98 8/21/98 9/1/98 9/10/98 9/17/98 9/24/98 10/1/98 10/8/98 11/6/98 11/19/98 11/23/98 12/4/98 12/7/98 12/17/98 12/21/98 1/6/99 1/14/99 1/20/99 1/27/99 2/2/99 2/10/99 2/17/99 2/25/99 3/3/99	4/4/96 5/27/97 6/24/97 7/2/97 7/17/97 7/30/97 8/14/97 8/26/97 9/9/97 10/6/97 11/17/97 12/15/97 2/4/98 2/10/98 4/1/98 7/8/98 8/21/98 9/1/98 9/10/98 9/17/98 9/24/98 10/1/98 10/8/98 11/6/98 11/19/98 11/23/98 12/4/98 12/7/98 12/17/98 12/21/98 1/6/99 1/14/99 1/20/99 1/27/99 2/2/99 2/10/99 2/17/99 2/25/99 3/3/99		4/4/96		4/4/96 5/27/97

SAMPLE LOCATION	Inorganics	Volatile Organics	Semivolatile Organics	Semivolatile Organics	Pesticides	Other Organics	Radiological Activity
METHODS	Various	524.2	525.2	625	504, 505, 507, 515, and/or 531	LC-MS	Various
Well 22, continued		4/21/99 5/5/99 5/12/99 5/19/99 5/26/99 6/2/99 6/9/99 6/16/99 6/23/99 6/30/99	4/21/99 5/5/99 5/12/99 5/19/99 5/26/99 6/2/99 6/9/99 6/16/99 6/23/99 6/30/99				
Well 24	10/10/96 10/28/96	10/10/96 5/27/97 6/24/97 7/2/97 7/17/97 7/30/97 8/14/97 8/26/97 9/9/97 10/6/97 11/17/97 2/10/98 4/1/98 7/8/98 8/21/98 10/8/98 3/12/99 6/16/99	10/10/96 5/27/97 6/24/97 7/2/97 7/17/97 7/30/97 8/14/97 8/26/97 8/27/97 9/9/97 10/6/97 11/17/97 2/10/98 4/1/98 7/8/98 8/21/98 10/8/98 3/12/99 3/17/99 6/16/99	10/10/96	8/27/96* 10/10/96	8/27/96 10/10/96	10/10/96 5/27/97
Well 26 #	4/4/96 10/28/96	4/4/96	4/4/96		4/4/96 8/27/96*	8/27/96	4/4/96
Well 28 #	4/4/96 10/28/96	4/4/96	4/4/96		4/4/96 8/27/96*	8/27/96	4/4/96
Wells 26+28 after air stripper #	4/4/96	4/4/96	4/4/96		4/4/96		4/4/96

SAMPLE LOCATION	Inorganics	Volatile Organics	Semivolatile Organics	Semivolatile Organics	Pesticides	Other Organics	Radiological Activity
METHODS	Various	524.2	525.2	625	504, 505, 507, 515, and/or 531	LC-MS	Various
Well 29	4/4/96 10/28/96	4/4/96 5/27/97 6/24/97 7/2/97 7/17/97 7/30/97 8/14/97 9/9/97 10/6/97 11/17/97 12/15/97 2/10/98 4/1/98 7/8/98 8/21/98 9/1/98 9/10/98 9/17/98 9/24/98 10/1/98 10/8/98 10/15/98 10/22/98 10/27/98 11/6/98 11/19/98 11/23/98 12/4/98 12/7/98 12/17/98 12/21/98 1/6/99 1/14/99 1/20/99 1/27/99 2/2/99 2/10/99 2/17/99 2/25/99	4/4/96 5/27/97 6/24/97 7/2/97 7/17/97 7/30/97 8/14/97 9/9/97 10/6/97 11/17/97 12/15/97 2/10/98 4/1/98 7/8/98 8/21/98 9/1/98 9/10/98 9/17/98 9/24/98 10/1/98 10/8/98 10/15/98 10/22/98 10/27/98 11/6/98 11/19/98 11/23/98 12/4/98 12/7/98 12/17/98 12/21/98 1/6/99 1/14/99 1/20/99 1/27/99 2/2/99 2/10/99 2/17/99 2/25/99		4/4/96 8/27/96*	8/27/96 10/16/96	4/4/96 5/27/97 6/5/97

SAMPLE LOCATION	Inorganics	Volatile Organics	Semivolatile Organics	Semivolatile Organics	Pesticides	Other Organics	Radiological Activity
METHODS	Various	524.2	525.2	625	504, 505, 507, 515, and/or 531	LC-MS	Various
Well 29, continued		4/28/99 5/5/99 5/12/99 5/19/99 5/26/99 6/2/99 6/9/99 6/16/99 6/23/99 6/30/99	4/28/99 5/5/99 5/12/99 5/19/99 5/26/99 6/2/99 6/9/99 6/16/99 6/23/99 6/30/99				
Well 39	8/21/96	8/21/96 7/23/97	8/21/96 7/23/97	8/21/96	8/21/96	8/21/96	9/3/96 7/23/97
Well 41	8/21/96	8/21/96 7/23/97	8/21/96 7/23/97	8/21/96	8/21/96	8/21/96	9/3/96 7/23/97
Well 42	4/4/96 10/28/96	4/4/96 4/2/97	4/4/96 4/2/97 4/22/97 4/25/97	4/2/97	4/4/96	8/27/96	4/4/96 6/5/97

SAMPLE LOCATION	Inorganics	Volatile Organics	Semivolatile Organics	Semivolatile Organics	Pesticides	Other Organics	Radiological Activity
METHODS	Various	524.2	525.2	625	504, 505, 507, 515, and/or 531	LC-MS	Various
Well 44	10/10/96	10/10/96 5/15/97 5/27/97 6/5/97 6/24/97 7/2/97 7/17/97 7/30/97 8/14/97 8/26/97 9/9/97 10/6/97 11/17/97 12/15/97 2/10/98 4/1/98 7/8/98 8/21/98 10/8/98 3/12/99 6/16/99	10/10/96 5/15/97 5/27/97 6/5/97 6/24/97 7/2/97 7/17/97 7/30/97 8/14/97 8/26/97 8/27/97 9/9/97 10/6/97 11/17/97 12/15/97 2/10/98 4/1/98 7/8/98 8/21/98 10/8/98 3/12/99 6/16/99	10/10/96	10/10/96	10/10/96	10/10/96 5/27/97 6/5/97
Well 45	2/11/98	2/11/98	2/11/98				2/11/98
POE 12: Windsor	6/17/96 7/8/96	6/17/96 7/8/96	6/17/96 7/8/96	6/17/96 7/8/96	6/17/96 7/8/96	6/17/96 7/8/96	6/17/96 12/5/96 1/13/97
Well 40	7/8/96	7/8/96 11/21/96	7/8/96 11/21/96		7/8/96	7/8/96	5/20/96
Comparison Samples							
Beachwood Elementary	3/28/96	3/28/96	3/28/96		3/28/96	3/28/96	3/28/96
Pine Beach Elementary	3/28/96	3/28/96	3/28/96		3/28/96	3/28/96	3/28/96

SAMPLE LOCATION	Inorganics	Volatile Organics	Semivolatile Organics	Semivolatile Organics	Pesticides	Other Organics	Radiological Activity
METHODS	Various	524.2	525.2	625	504, 505, 507, 515, and/or 531	LC-MS	Various
Cedar Glen #2 (Manchester)	5/6/96	5/6/96	5/6/96	5/6/96	5/6/96 8/27/96	5/6/96 8/27/96	5/6/96
Crestwood Village #4 (Manchester)	5/6/96	5/6/96	5/6/96	5/6/96	5/6/96	5/6/96	5/6/96
Crestwood Village #5 (Manchester)	5/6/96	5/6/96	5/6/96	5/6/96	5/6/96	5/6/96	5/6/96
Norm's Dale (Egg Harbor)	5/1/96	5/1/96	5/1/96	5/1/96	5/1/96	5/1/96	5/2/96
Great Bear (Bottled Water)	5/1/96	5/1/96	5/1/96	5/1/96	5/1/96		5/1/96

* Samples taken 8/27/96 were analyzed using method 507 in an attempt to identify an unknown substance later determined to be styrene-acrylonitrile trimer.

\# Sampling events for wells 26 and 28 and air-stripped water are presented in this table only for the time period prior to November 1996. See Tables 6c and 7c for additional sampling events for wells 26 and 28 and for the combined treated effluent of these wells. (Data packages also contain analysis results for samples taken at intermediate points in the treatment system. These data are not discussed in this Public Health Consultation.)

Table 4. Target analytes for analytical methods used to test UWTR drinking water samples, March 1996 through October 1998. During the period, target analytes may have changed due to method modifications and enhancements. Some chemicals may appear on more than one target list.

Volatile Organic Chemicals

USEPA Method 524.2

1,1,2,2-tetrachloroethane
1,3-dichloropropane
1,2,3-trichlorobenzene
1,2-dibromoethane
1,1,2-trichloroethane
1,2,4-trichlorobenzene
1,2-dibromo-3-chloropropane
1,1-dichloroethene
1,1,1,2-tetrachloroethane
1,2-dichlorobenzene
1,1-dichloropropanone
1,2-dichloropropane
1,4-dichlorobenzene
1,3-dichlorobenzene
1,2-dichloroethane
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
1,1-dichloroethane
1,1,1-trichloroethane
1,1-dichloropropene
1,2,3-trichloropropane
1-chlorobutane
2,2-dichloropropane
2-butanone
2-chlorotoluene
2-hexanone
2-nitropropane
4-chlorotoluene
4-methyl-2-pentanone
acetone
acrylonitrile
allyl chloride
benzene
bromobenzene
bromochloromethane
bromodichloromethane
bromoform
bromomethane
carbon tetrachloride
carbon disulfide
chloroacetonitrile
chlorobenzene
chloroethane
chloroform
chloromethane
cis-1,3-dichloropropene
cis-1,2-dichloroethene
dibromochloromethane
dibromomethane
dichlorodifluoromethane
diethyl ether
ethyl methacrylate
ethylbenzene
hexachlorobutadiene
hexachloroethane
isopropylbenzene
m,p-xylenes
methacrylonitrile
methyl iodide
methyl acrylate
methyl tert-butyl ether
methylene chloride
methylmethacrylate
n-butylbenzene
n-propylbenzene
naphthalene
nitrobenzene
o-xylene
p-isopropyltoluene
pentachloroethane
propionitrile
sec-butylbenzene
styrene
tert-butyl alcohol
tert-butylbenzene
tetrachloroethene
tetrahydrofuran
toluene
trans-1,4-dichloro-2-butene
trans-1,2-dichloroethene
trans-1,3-dichloropropene
trichloroethene
trichlorofluoromethane
vinyl chloride

Semivolatile Organic Chemicals

USEPA Method 525.2

2,2',3,3',4,4',6-heptachlorobiphenyl
2,2',3,3',4,5,6,6'-octachlorobiphenyl
2,4,5-trichlorobiphenyl
2,2',4,4'-tetrachlorobiphenyl
2,2',4,4',5,6-hexachlorobiphenyl
2,2',3,4,6-pentachlorobiphenyl
2,3-dichlorobiphenyl
2-chlorobiphenyl
acenaphthylene
alachlor
aldrin
alpha-chlordane
anthracene
atrazine
benzo[a]pyrene
benzo[b]fluoranthene
benzo[g,h,i]perylene
benzo[k]fluoranthene
benz[a]anthracene
butylbenzylphthalate
chrysene
di(2-ethylhexyl)adipate
di(2-ethylhexyl)phthalate
di-n-butylphthalate
dibenz[a,h]anthracene
diethylphthalate
dimethylphthalate
endrin
fluorene
gamma-chlordane
heptachlor
heptachlor epoxide
hexachlorobenzene
hexachloropentadiene
indeno[1,2,3,c,d]pyrene
lindane
methoxychlor
pentachlorophenol

phenanthrene
pyrene
simazine
THNA trimers
trans-nonachlor

USEPA Method 625

1,3-dichlorobenzene
1,2,4-trichlorobenzene
1,2-dichlorobenzene
1,4-dichlorobenzene
2,4,6-trichlorophenol
2,4-dinitrophenol
2,4,5-trichlorophenol
2,4-dimethylphenol
2,6-dinitrotoluene
2,4-dichlorophenol
2,4-dinitrotoluene
2-chloronaphthalene
2-chlorophenol
2-nitrophenol
3,3'-dichlorobenzidene
4,6-dinitro-2-methyl phenol
4-bromophenyl phenyl ether
4-chloro-3-methylphenol
4-chlorophenyl phenyl ether
4-nitrophenol
acenaphthene
acenaphthylene
anthracene
benzo[a]anthracene
benzo[a]pyrene
benzo[b]fluoranthene
benzo[g,h,i]perylene
benzo[k]fluoranthene
bis(2-chloroethoxy) methane
bis(2-chloroethyl) ether
bis(2-chloroisopropyl) ether
bis(2-ethylhexyl) phthalate
butylbenzylphthalate
chrysene
di-n-butylphthalate
di-n-octylphthalate
dibenz[a,h]anthracene
diethylphthalate
dimethylphthalate
fluoranthene
fluorene
hexachlorobenzene
hexachlorobutadiene
hexachlorocyclopentadiene
hexachloroethane
indeno[1,2,3,c,d]pyrene
isophorone
N-nitrosodi-n-butylamine
N-nitrosodi-n-propylamine
N-nitrosodiethylamine
N-nitrosodiphenylamine
N-nitrosopyrrolidine
naphthalene
nitrobenzene
pentachlorobenzene
pentachlorophenol
phenanthrene
phenol
pyrene

<u>Pesticides and Related Organic Chemicals</u>

USEPA Method 504.2

1,2-dibromo-3-chloropropane (DBCP)
1,2-dibromoethane (EDB)

USEPA Method 505

alachlor
aldrin
atrazine
chlordane
dieldrin
endrin
heptachlor epoxide
heptachlor
hexachlorobenzene
hexachlorocyclopentadiene
lindane
methoxychlor
PCBs
simazine
toxaphene

USEPA Method 507

alachlor
ametraton
ametryn
atraton
atrazine
bromacil
butachlor
butylate
carboxin
chlorpropham
cycloate
diazinon
dichlorvos
diphenamide
disulfoton
disulfoton sulfone
disulfoton sulfoxide
EPTC
ethoprop
fenaminphos
fenarimol
fluridone
hexazinone
merphos
methyl paraoxon
metolachlor
metribuzin
mevinphos
MGK 264
molinate
napropamide
norflurazon
pebulate
prometon
prometryn
pronamide
propazine
simazine
simetryn
stirofos
tebuthiuron
terbacil
terbafos
terbutryn
triadimefon
tricyclazole
vernolate

USEPA Method 515.2

2,4,5-T
2,4-DB
2,4,5-TP
2,4-D
3,5-benzoacid
4-nitrophenol

acifluorfen
bentazon
chloramben
dalapon
DCPA
dicamba
dichloroprop
dinoseb
pentachlorophenol
picloram

USEPA Method 531.1

aldicarb
aldicarb sulfone
aldicarb sulfoxide
carbaryl
carbofuran
3-hydroxy-carbofuran
methomyl
methiocarb
oxamyl
propoxur

<u>Metals and Other Inorganic Chemicals</u>

Various Methods

arsenic
antimony
asbestos
barium
beryllium
cadmium
chromium
copper
lead
mercury
molybdenum
nickel
nitrate
nitrite
selenium
tin
thallium

<u>Radiological Activity</u>

gross alpha activity
gross beta activity
radium-226
radium-228
radon-222
uranium
gamma activity

Table 5. Index to laboratory data package volumes containing results from UWTR samples, March 1996 through December 1998. Missing numbers in volume sequence refer to data packages that contain data unrelated to United Water Toms River samples (such as site monitoring wells, soils, etc.), with one exception. Volume 26 contained a preliminary draft report (not publicly released) of Rutgers Center for Advanced Food Technology laboratory analyses. The full, final data report is found in Volumes 61 through 64.

Volume	NJDHSS Lab Sample Batches	Sample Descriptions, Locations and Dates	Volume Contents
1	96OCP00001 96OCP00002 96OCP00003 96OCP00004	Distribution system (school) drinking water samples *3/28, 3/29, 4/1, 4/9/96*	chain of custody; laboratory chronicle; methodology summary; case narrative; method 524.2 results
2			method 524.2 results (continued); method 525.2 results
3			method 525.2 results (continued); method 505 results
4			preliminary metals results (see Volume 16)
5			preliminary metals results (continued); asbestos results
6 (in part)			method 507 results; preliminary radiological results (see Volume 15)
6 (in part)	96SDW00065	South Toms River, Indian Head, Route 70, Berkeley and Parkway points of entry; South Toms River well 32, Indian Head well 20, Route 70 well 31, Berkeley well 33, and Parkway wells 22, 26, 28, 29, 42, air-stripped water from wells 26+28; two distribution (school) samples *4/4/96*	preliminary radiological results (see Volume 15)
7			method 504 results; method 507 results
8			method 515.2 results; method 531.1 results
9			chain of custody, laboratory chronicle, methodology summary, case narrative; method 524.2 results
10			method 525.2 results
11			method 525.2 results (continued); method 505 results
12			metals results
13			metals results (continued)

<table>
<tr><th>Volume</th><th>NJDHSS Lab
Sample Batches</th><th>Sample Descriptions,
Locations and Dates</th><th>Volume Contents</th></tr>
<tr><td>14</td><td>96SDW00079</td><td>Holly, South Toms River, Indian Head, Route 70, Berkeley, Parkway point of entry; two distribution system (school) samples
4/24/96</td><td>chain of custody; methodology summary; laboratory chronicle; case narrative; method 625 results</td></tr>
<tr><td>15</td><td>96OCP00001
96SDW00065</td><td>See Vols. 1 and 9; also Indian Head point of entry and well 20, Route 70 point of entry and well 31
4/9/96</td><td>chain of custody; methodology summary; laboratory chronicle; case narrative; radiological results</td></tr>
<tr><td>16</td><td>96OCP00001</td><td>See Vol. 1</td><td>chain of custody; methodology summary; laboratory chronicle; case narrative; metals results</td></tr>
<tr><td>17</td><td>(NJDEP laboratory)</td><td>Laboratory comparability study: Holly, South Toms River, Berkeley, Parkway points of entry; Indian Head well 20, Route 70 well 31
4/25/96</td><td>chain of custody; methodology summary; laboratory chronicle; case narrative; radiological results</td></tr>
<tr><td>18</td><td rowspan="2">96SDW00078</td><td rowspan="2">Holly point of entry and well 30
4/24/96</td><td>chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; method 525.2 results; method 505 results; method 625 results</td></tr>
<tr><td>19</td><td>method 625 results (continued); metals results</td></tr>
<tr><td>20</td><td rowspan="3">96SDW00084
96SDW00085</td><td rowspan="3">Comparison samples (wells in Ocean and Atlantic Counties, bottled water)
5/1, 5/2, 5/6/96</td><td>chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; method 525.2 results</td></tr>
<tr><td>21</td><td>method 525.2 results (continued); method 505 results; method 625 results</td></tr>
<tr><td>22</td><td>method 625 results (continued); metals results</td></tr>
<tr><td>23</td><td>(NJDEP laboratory)</td><td>Indian Head point of entry, well 20 and nearby distribution (hydrant) samples
7/10-7/12/96</td><td>chain of custody; methodology summary; laboratory chronicle; case narrative; preliminary radiological results (see Volume 36)</td></tr>
</table>

Volume	NJDHSS Lab Sample Batches	Sample Descriptions, Locations and Dates	Volume Contents
24	(NJDEP laboratory)	Brookside well 15, Windsor well 40, Indian Head well 20, and Route 70 well 31 *5/20/96*	chain of custody; methodology summary; laboratory chronicle; case narrative; radiological results
25	(NJDEP laboratory)	Short term variability study: South Toms River, Route 70 points of entry; South Toms River well 38 and Route 70 well 31 *6/10-6/14/96*	chain of custody; methodology summary; laboratory chronicle; case narrative; radiological results
27	96SDW00140	Brookside and Windsor points of entry; Brookside well 15, Berkeley well 35, Windsor well 40 *7/8/96*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; method 525.2 results
28			method 505 results; method 625 results
29			metals results
30	96SDW00141	Berkeley well 33 *7/8/96*	chain of custody; methodology summary; laboratory chronicle; case narrative; metals (lead) results
31	96SDW00118	Brookside and Windsor points of entry *6/17/96*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; method 525.2 results; method 505 results; method 625 results
32			metals results
33	(NJDEP laboratory)	Second quarterly radiological screening: South Toms River, Route 70, Berkeley, Parkway points of entry *7/19/96*	chain of custody; methodology summary; laboratory chronicle; case narrative; radiological results
36	(NJDEP laboratory)	Indian Head point of entry, well 20 and nearby distribution system samples *7/10-7/12/96*	chain of custody; methodology summary; laboratory chronicle; case narrative; radiological results
38	96SDW00084 96SDW00085 96SDW00078	*See Vol. 20*; also Holly plant well 30 *4/24/96*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 504 results; method 507 results; method 515.2 results; method 531.1 results; chain of custody; methodology summary; laboratory chronicle; case narrative; method 507 results

Volume	NJDHSS Lab Sample Batches	Sample Descriptions, Locations and Dates	Volume Contents
39	96OCP00001 96SDW00065	*See Vols. 1 and 9*	results of Finnigan ion trap experiments
40			results of Finnigan 5100 quadropole experiments; method 525 extracted ion current profiles
41	96SDW00173 (NJDEP laboratory)	*See Vol. 42*; also Holly well 30, South Toms River well 32, Route 70 well 31, Berkeley wells 33 and 34, Parkway wells 24, 26, 28, 29 and comparison well *8/27/96*	results of Finnigan ion trap experiments
42	96SDW00173	Parkway wells 39, 41 and Holly wells 21 and 37 *8/21, 9/3/96*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; method 525.2 results; method 505 results
43			method 625 results; metals results
45	96SDW00223	South Toms River, Indian Head, Route 70, Berkeley, Parkway points of entry; South Toms River well 32, Route 70 well 31, Berkeley wells 33, 34, 35, Parkway wells 22, 24, 26, 28, 29, 42 *10/28/96*	chain of custody; methodology summary; laboratory chronicle; case narrative; general chemistry (nitrate, nitrite and chloride) results
46	96SDW00173 96SDW00211 96SDW00215 96OCP00009	*See Vols. 42 and 48*	chain of custody; methodology summary; laboratory chronicle; case narrative; radiological results
47	96SDW00118 96SDW00140 96SDW00173 96SDW00211 96SDW00215	*See Vols. 27, 31, 42, 48*	laboratory deliverable summary; analytical results summary; conformance summary; chain of custody; method 504 results; method 507 results; method 515 results; method 531 results
48	96SDW00211 96SDW00215	Parkway wells 24, 44 *10/10/96* South Toms River well 38, Berkeley well 34 *10/16/96*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; method 525.2 results
49			method 525.2 results (continued); method 505 results; method 625 results
50			metals results

Volume	NJDHSS Lab Sample Batches	Sample Descriptions, Locations and Dates	Volume Contents
51			metals results (continued); general chemistry results; bacteriology results (Parkway well 44)
54	96SDW00084 96SDW00085 96SDW00118 96SDW00211 96SDW00215	*See Vols. 20, 31, 48*	chain of custody; methodology summary; laboratory chronicle; case narrative; radiological results
57	96OCP00010 96OCP00011 96OCP00012	Holly wells 21, 30, 37, South Toms River wells 32, 38, Indian Head well 20, Route 70 well 31, Berkeley wells 33, 34, 35, Windsor well 40 *11/21, 12/5, 12/9/96*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results
58			results of selective ion monitoring for acrylonitrile; method 525.2 results
59			method 525.2 results (continued)
61	96OCP00001 96SDW00065	*See Vols. 1 and 9*	chain of custody; methodology summary; laboratory chronicle; case narrative; results of Rutgers Center for Advanced Food Technology analyses for nonvolatile synthetic organics by high performance liquid chromatography
62	96SDW00118 96SDW00140 96SDW00173 96SDW00211 96SDW00215	See Vols. 27, 31, 42, 48; also water treatment chemical sample *12/9/96*	chain of custody; methodology summary; laboratory chronicle; case narrative; results of Rutgers Center for Advanced Food Technology analyses for nonvolatile synthetic organics by high performance liquid chromatography (HPLC)
63			HPLC results, continued
64			HPLC results, continued
65	(NJDEP laboratory)	Third quarterly radiological screening: Holly, Route 70, Berkeley, Windsor points of entry *12/5/96*	chain of custody; methodology summary; laboratory chronicle; case narrative; radiological results
66	(NJDEP laboratory)	Fourth quarterly radiological screening: Holly, Indian Head, Route 70, Berkeley, Windsor points of entry *1/13/97*	chain of custody; methodology summary; laboratory chronicle; case narrative; radiological results

Volume	NJDHSS Lab Sample Batches	Sample Descriptions, Locations and Dates	Volume Contents
82	96OCP00026 96OCP00028	Parkway well 22, 24, 29, 44; Indian Head well 20 *6/24, 7/2/97*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile
83			method 525.2 (including trimer) results
84	97OCP00032 97OCP00033	Parkway wells 22, 24, treated effluent from wells 26+28, 29, 44; Indian Head well 20 *7/16, 7/17/97*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile
85			method 525.2 (including trimer) results
86	97OCP00021 97OCP00024	South Toms River, Indian Head, Route 70, Berkeley, Parkway points of entry, Indian Head well 20; Parkway wells 22, 24, 29, 42, 44, Brookside wells 15, 43 *5/27, 6/5/97*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results; method 505 results
87			chain of custody; methodology summary; laboratory chronicle; case narrative; radiological results
88	97OCP00034	Parkway wells 39, 41 *7/23/97*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
89	97OCP00037	Parkway wells 22, 24, 29, 44 *7/30/97*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
90	97OCP00029	Parkway treated effluent from wells 26+28 *7/9/97*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 525.2 (including trimer) results
91	97OCP00036	Parkway treated effluent from wells 26+28 *7/24/97*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 525.2 (including trimer) results
92	97OCP00038	Parkway treated effluent from wells 26+28 *8/6/97*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 525.2 (including trimer) results

Volume	NJDHSS Lab Sample Batches	Sample Descriptions, Locations and Dates	Volume Contents
93	97OCP00039	Parkway wells 26, 28, treated effluent from wells 26+28 *8/12/97*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
94	97OCP00047	Parkway wells 24, 44 *8/27/97*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 525.2 (including trimer) results
95	97OCP00040	Parkway wells 22, 24, 26, 28, 29, 44, treated effluent from wells 26+28 *8/14/97*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
96	97OCP00027	Quarterly radiological samples: Route 70, Berkeley, Parkway points of entry; nearby distribution system samples *7/1/97*	chain of custody; methodology summary; laboratory chronicle; case narrative; radiological results
114	97OCP00035	Parkway wells 39, 41, *7/23/97*	chain of custody; methodology summary; laboratory chronicle; case narrative; radiological results
115	97SDW00133	Parkway well 44, Brookside well 43 *5/15/97*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 results; metals results
116	97OCP00046	Parkway well 22, 24, 29, 44, treated effluent from wells 26+28; Indian Head well 20 *8/26/97*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
117	97OCP00058	Parkway well 22, 24, 26, 28, 29, 44, treated effluent from wells 26+28; Indian Head well 20 *10/6/97*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
118	97OCP00053	Parkway well 22, 24, 26, 28, 29, 44, treated effluent from wells 26+28; Indian Head well 20 *9/9/97*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results

Volume	NJDHSS Lab Sample Batches	Sample Descriptions, Locations and Dates	Volume Contents
119	97OCP00050	Parkway well 26, 28, treated effluent from wells 26+28 *9/2/97*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
120	98OCP00002	Parkway well 22 *2/4/98*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
121	97OCP00042	Parkway well 26, 28, treated effluent from wells 26+28 *8/19/97*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results (data rejected due to carry-over); results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
122	97OCP00057	Parkway treated effluent from wells 26+28 *9/24/97*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
123	98OCP00003 98OCP00004 98OCP00005	Parkway wells 22, 24, 26, 28, 29, treated effluent from wells 26+28 *2/10/98* Parkway well 45 *2/11/98*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
124	98OCP00003 98OCP00004 98OCP00005	Parkway wells 22, 24, 26, 28, 29, treated effluent from wells 26+28 *2/10/98* Parkway well 45 *2/11/98*	method 525.2 (including trimer) results (continued); metals results; general chemistry results; chain of custody; methodology summary; laboratory chronicle; case narrative; radiological results; bacteriology results
125	98OCP00006	Parkway wells 22, 24, 26, 28, 29, treated effluent from wells 26+28 *4/1/98*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
126	97OCP00060	Parkway treated effluent from wells 26+28 *10/21/97*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results

Volume	NJDHSS Lab Sample Batches	Sample Descriptions, Locations and Dates	Volume Contents
127	97OCP00061	Parkway wells 22, 24, 26, 28, 29, treated effluent from wells 26+28, Indian Head well 20 *11/17/97*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
128	97OCP00063	Parkway wells 22, 26, 28, 29, treated effluent from wells 26+28 *12/15/97*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
129	97SDW00060 97OCP00010 97OCP00011 97OCP00012	Parkway well 42, Brookside well 43 *4/2/97* Parkway well 42 *4/22, 4/25/97* Brookside well 43 *4/23/97*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
130			method 525.2 (including trimer) results (continued); method 625 results; metals results; general chemistry results; bacteriology results; chain of custody; methodology summary; laboratory chronicle; case narrative; radiological results
132	98OCP00008	Parkway wells 22, 24, 26, 28, 29, treated effluent from wells 26+28 *7/8/98*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
133			method 525.2 (including trimer) results (continued)
134	98OCP00009	Parkway wells 26, 28, treated effluent from wells 26+28 *8/10, 8/13/98*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
135	98OCP00010	Parkway point of entry, wells 22, 24, 29, 44 *8/21/98*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
136			Lancaster Laboratories method 525.2 results

Volume	NJDHSS Lab Sample Batches	Sample Descriptions, Locations and Dates	Volume Contents
137	98OCP00011	Parkway point of entry, wells 22, 29 *9/1/98*	Lancaster Laboratories method 525.2 results
138			chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
139	98OCP00012	Parkway point of entry, wells 22, 29 *9/10/98*	Lancaster Laboratories method 525.2 results
140	98OCP00013	Parkway point of entry, well 29 *9/17/98*	Lancaster Laboratories method 525.2 results
141	98OCP00012	Parkway point of entry, wells 22, 29 *9/10/98*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
142	98OCP00014	Parkway point of entry, well 29 *9/24/98*	Lancaster Laboratories method 525.2 results
143	98OCP00017	Parkway point of entry, wells 22, 29 *10/15/98*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
144	98OCP00018	Parkway point of entry, wells 22, 29 *10/22/98*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
145	98OCP00016	Parkway wells 22, 24, 26, 28, 29, treated effluent from wells 26+28, 44 *10/8/98*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
146	98OCP00019	Parkway point of entry, well 29 *10/27/98*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results

Volume	NJDHSS Lab Sample Batches	Sample Descriptions, Locations and Dates	Volume Contents
147	98OCP00013	Parkway point of entry, wells 22, 29 *9/17/98*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
148	98OCP00016 98OCP00017	Parkway point of entry, well 29 *10/15/98*	Lancaster Laboratories method 525.2 results
149	98OCP00014	Parkway point of entry, wells 22, 29 *9/24/98*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
150	98OCP00015	Parkway point of entry, wells 22, 29 *10/1/98*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
151	98OCP00020	Parkway point of entry, wells 22, 29 *11/6/98*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
152	98OCP00021 98OCP00022	Parkway point of entry, wells 22, 29 *11/19, 11/23/98*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
153			method 525.2 (including trimer) results (continued)
154	98OCP00023 98OCP00024	Parkway point of entry, wells 22, 29 *12/4, 12/7/98*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
155	98OCP00025 98OCP00026	Parkway point of entry, wells 22, 29 *12/17, 12/21/98*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results

Volume	NJDHSS Lab Sample Batches	Sample Descriptions, Locations and Dates	Volume Contents
156	99OCP00001 99OCP00002 99OCP00003 99OCP00004	Parkway point of entry, wells 22, 29 *1/6, 1/14, 1/20, 1/27/99*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results
157			method 524 results (continued); results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
158			method 525.2 (including trimer) results (continued)
159			method 525.2 (including trimer) results (continued)
160	99OCP00005	Parkway point of entry, wells 22, 29 *2/2/99*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
161	99OCP00009 99OCP00010	Parkway point of entry, wells 22, 29 *3/3, 3/12/99*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
162			method 525.2 (including trimer) results (continued)
163	99OCP00006 99OCP00007 99OCP00008	Parkway point of entry, wells 22, 29 *2/10, 2/17, 2/25/99*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile
164			method 525.2 (including trimer) results
165			method 525.2 (including trimer) results (continued)
166	99OCP00011	Parkway point of entry, wells 22, 29 *3/17/99*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
167	99OCP00012	Parkway point of entry, wells 22, 29 *3/25/99*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results

Volume	NJDHSS Lab Sample Batches	Sample Descriptions, Locations and Dates	Volume Contents
168	99OCP00015 99OCP00016	Parkway point of entry, wells 22, 29 *4/14, 4/21/99*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
169			method 525.2 (including trimer) results (continued)
170	99OCP00013 99OCP00014	Parkway point of entry, wells 22, 29 *3/31, 4/7/99*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
171			method 525.2 (including trimer) results (continued)
172	99OCP00018 99OCP00019	Parkway point of entry, wells 22, 29 *4/28, 5/5/99*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
173	99OCP00020	Parkway point of entry, wells 22, 29 *5/12/99*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results

Volume	NJDHSS Lab Sample Batches	Sample Descriptions, Locations and Dates	Volume Contents
174	99OCP00025	Parkway point of entry, wells 22, 24, 26, 28, 29, 44, treated effluent from wells 26+28, 22, 29 *6/16/99*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile
175			method 525.2 (including trimer) results
176	99OCP00022 99OCP00023	Parkway point of entry, wells 22, 29 *5/26, 6/2/99*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
177			method 525.2 (including trimer) results (continued)
178	99SDW00255	Well 20 and nearby distribution (hydrant) samples *6/9/99*	chain of custody; methodology summary; laboratory chronicle; case narrative; radiological results
179	99OCP00021	Parkway point of entry, wells 22, 29 *5/19/99*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
180	99OCP00024	Parkway point of entry, wells 22, 29, 26, 28; treated effluent from 26+28, 22, 29 *6/9/99*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile
181			method 525.2 (including trimer) results
182	99OCP00028	Parkway point of entry, wells 22, 29 *6/23/99*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results

Volume	NJDHSS Lab Sample Batches	Sample Descriptions, Locations and Dates	Volume Contents
183	99OCP00030 (99OCP00031)	Parkway point of entry, wells 22, 29 *6/30/99* *(Data packages 183 and 184 also include samples taken 7/7/99, not reported in this Public Health Consultation)*	chain of custody; methodology summary; laboratory chronicle; case narrative; method 524.2 results; results of selective ion monitoring for acrylonitrile; method 525.2 (including trimer) results
184			method 525.2 (including trimer) results (continued)
No number	97OCP00030	Well 31; well 20 and nearby hydrants *7/16/97*	chain of custody; methodology summary; laboratory chronicle; case narrative; radiological results

Table 6a. Volatile organic chemical results, distribution (school) samples: United Water Toms River community water supply, March 1996 through December 1998.

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)								
		Total Trihalo-methanes	Trichloro-ethylene	Tetra-chloro-ethylene	1,1,1-Trichloro-ethane	1,2-Dichloro-ethane	MTBE	Xylenes	Toluene	Other Volatile Organic Chemicals
		MCL = 100	MCL = 1	MCL = 1	MCL = 30	MCL = 2	MCL = 70	MCL = 1,000	MCL = 1,000	See Notes for Abbreviations and MCLs
Toms River High School East	3/28/96	1.6	0.8	BD	BD	BD	BD	J	BD	
Toms River High School North	3/28/96	0.9	BD	BD	BD	BD	BD	BD	BD	
Toms River High School South	3/28/96	1.0	BD	BD	BD	BD	BD	BD	BD	
Alternate Learning Center	3/28/96	3.6	BD	BD	BD	BD	BD	BD	BD	
Toms River Intermediate East	3/28/96	3.7	1.0	BD	BD	BD	BD	1.5	0.5	Ethylbenzene: 0.2
Toms River Intermediate West	3/28/96 4/4/96	2.6 2.1	1.0 1.0	BD J	BD BD	BD BD	BD 0.5	0.2 BD	J BD	 Ethylbenzene: 0.3
Cedar Grove Elementary	3/28/96	2.7	1.0	BD	BD	BD	BD	0.2	J	
East Dover Elementary	3/28/96 4/4/96	3.8 1.5	0.3 BD	BD BD	BD BD	BD BD	BD BD	BD BD	BD BD	 MC: 0.4
Hooper Ave. Elementary	3/28/96	2.6	0.9	BD	BD	BD	BD	9.0	2.0	Ethylbenzene: 1.0
North Dover Elementary	3/28/96 3/29/96	2.3 3.3	BD BD	BD BD	BD BD	BD BD	J J	BD BD	BD BD	

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)								
		Total Trihalo-methanes	Trichloro-ethylene	Tetra-chloro-ethylene	1,1,1-Trichloro-ethane	1,2-Dichloro-ethane	MTBE	Xylenes	Toluene	Other Volatile Organic Chemicals
		MCL = 100	MCL = 1	MCL = 1	MCL = 30	MCL = 2	MCL = 70	MCL = 1,000	MCL = 1,000	See Notes for Abbreviations and MCLs
Silver Bay Elementary	3/28/96	5.0	0.5	BD	BD	BD	BD	0.7	J	
South Toms River Elementary	3/28/96	3.0	BD	BD	BD	BD	BD	BD	BD	
Walnut St. Elementary	3/28/96	BD	BD	BD	BD	BD	BD	BD	BD	
Washington St. Elementary	3/28/96	0.9	BD	BD	BD	BD	BD	BD	BD	
West Dover Elementary	3/28/96	3.2	BD	BD	BD	BD	BD	BD	BD	Naphthalene: 0.7
Toms River Schools Admin. Bldg. – Special Education	3/28/96	2.5	0.6	BD	BD	BD	BD	J	BD	
Ambassador Christian Academy	3/28/96	BD	BD	BD	BD	BD	BD	BD	BD	
Ocean County College	3/28/96	2.7	1.0	BD	BD	BD	BD	0.7	J	
Ocean County VoTech	3/28/96	4.9	0.8	BD	BD	BD	BD	BD	J	
St. Joseph Elementary	3/28/96	BD	BD	BD	BD	BD	BD	BD	BD	
Monsignor Donovan High School	3/28/96	0.9	BD	BD	BD	BD	BD	BD	BD	

BD: Below the method detection limit (MDL); MDLs for volatile organic chemicals may vary between chemicals and from analysis to analysis, but are generally between 0.1 and 1.0 µg/l.

J: Chemical was detected in the sample, but at a level below the method detection limit.
MCL: Maximum Contaminant Level

Notes: MCLs for the following chemicals are: ethylbenzene, 700 µg/l; naphthalene, 300 µg/l; and MC (methylene chloride), 2 µg/l.

The NJDHSS reports experiencing sporadic contamination with acetone, chloromethane, and 2-butanone. Results for these chemicals are not reported in these tables. In addition, it should be noted that carbon disulfide, 2-hexanone and methylene chloride are commonly found in the trip and field blanks. Although values for these chemicals are reported in the tables (when not found in the blanks accompanying the samples), there is reason to doubt their presence in the source waters.

Total trihalomethanes include chloroform, bromodichloromethane, dibromochloromethane and bromoform. Concentrations include the sum of all reported values above the method detection limit.

Xylenes include the sum of m/p-xylenes and o-xylene.

No other target organic chemicals (see Table 4 for lists) were detected in these samples.

Table 6b. Volatile organic chemical results, point of entry and well samples: United Water Toms River community water supply, March 1996 through December 1998.

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)								
		Total Trihalo-methanes	Trichloro-ethylene	Tetra-chloro-ethylene	1,1,1-Trichloro-ethane	1,2-Dichloro-ethane	MTBE	Xylenes	Toluene	Other Volatile Organic Chemicals
		MCL = 100	MCL = 1	MCL = 1	MCL = 30	MCL = 2	MCL = 70	MCL = 1,000	MCL = 1,000	See Notes for Abbreviations and MCLs
POE 1: Holly	4/24/96	BD	BD	BD	BD	BD	BD	BD	BD	
Well 21	8/21/96	BD	BD	BD	BD	BD	BD	BD	BD	DCDFM: 2.0 MC: 0.8
	12/9/96	BD	BD	BD	BD	BD	J	BD	BD	DCDFM: 1.0
Well 30	4/24/96	BD	BD	BD	BD	BD	BD	BD	BD	
	11/21/96	BD	BD	BD	BD	BD	BD	BD	BD	
Well 37	8/21/96	BD	BD	BD	BD	BD	BD	BD	BD	MC: 0.8
	12/9/96	BD	BD	BD	BD	BD	BD	BD	BD	
POE 2: Brookside	6/17/96	J	BD	BD	BD	BD	BD	BD	BD	
	7/8/96	0.4	BD	BD	BD	BD	BD	BD	BD	
Well 15	7/8/96	BD	BD	BD	BD	BD	BD	BD	BD	
	6/5/97	BD	BD	BD	BD	BD	BD	BD	BD	
Well 43	4/2/97	BD	BD	BD	BD	BD	BD	BD	BD	
POE 3: South Toms River	4/4/96	1.0	BD	BD	BD	BD	BD	BD	BD	
Well 32	4/4/96	1.0	BD	BD	BD	BD	BD	BD	BD	
	12/9/96	2.0	BD	BD	BD	BD	BD	BD	BD	
Well 38	10/16/96	BD	BD	BD	BD	BD	BD	BD	BD	Naphthalene: 0.5
	12/9/96	BD	BD	BD	BD	BD	BD	BD	BD	

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)								
		Total Trihalo-methanes	Trichloro -ethylene	Tetra-chloro-ethylene	1,1,1-Trichloro -ethane	1,2-Dichloro-ethane	MTBE	Xylenes	Toluene	Other Volatile Organic Chemicals
		MCL = 100	MCL = 1	MCL = 1	MCL = 30	MCL = 2	MCL = 70	MCL = 1,000	MCL = 1,000	See Notes for Abbreviations and MCLs
POE 4: Indian Head	4/4/96	BD	BD	J	BD	BD	BD	BD	BD	4-Chlorotoluene: J*
Well 20	4/4/96	BD	BD	J	BD	BD	BD	BD	BD	4-Chlorotoluene: J*
	12/5/96	BD	BD	BD	BD	BD	BD	BD	BD	
	5/27/97	BD	BD	BD	BD	BD	BD	BD	BD	
	6/24/97	BD	BD	BD	BD	BD	BD	BD	BD	
	7/2/97	BD	BD	BD	BD	BD	BD	BD	BD	
	7/17/97	BD	BD	BD	BD	BD	BD	BD	BD	
	8/26/97	BD	BD	BD	BD	BD	BD	BD	BD	
	9/9/97	0.2	BD	J	BD	BD	BD	BD	BD	
	10/6/97	BD	J	J	BD	BD	BD	BD	BD	TCFM: J
	11/17/97	BD	BD	BD	BD	BD	BD	BD	BD	
POE 5: Route 70	4/4/96	1.0	BD	BD	BD	BD	0.7	BD	BD	
Well 31	4/4/96	1.0	BD	BD	BD	BD	0.7	BD	BD	
	11/21/96	1.0	BD	BD	BD	BD	BD	BD	BD	
POE 6: Berkeley	4/4/96	0.6	BD	BD	BD	BD	BD	BD	BD	
Well 33	4/4/96	0.8	BD	BD	BD	BD	BD	BD	BD	
	11/21/96	0.9	BD	BD	BD	BD	BD	BD	BD	
Well 34	10/16/96	J	BD	BD	BD	BD	BD	J	BD	Naphthalene: 7.0
	11/21/96	0.3	BD	BD	BD	BD	BD	BD	BD	Naphthalene: 23
Well 35	7/8/96	0.5	BD	BD	BD	BD	BD	BD	BD	
	11/21/96	0.5	BD	BD	BD	BD	BD	BD	BD	

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)								
		Total Trihalo-methanes	Trichloro-ethylene	Tetra-chloro-ethylene	1,1,1-Trichloro-ethane	1,2-Dichloro-ethane	MTBE	Xylenes	Toluene	Other Volatile Organic Chemicals
		MCL = 100	MCL = 1	MCL = 1	MCL = 30	MCL = 2	MCL = 70	MCL = 1,000	MCL = 1,000	See Notes for Abbreviations and MCLs
POE 7: Parkway	4/4/96	BD	0.9	J	BD	BD	0.4	BD	0.4	Ethylbenzene: 0.4
	8/21/98	1.3	J	BD	BD	0.2	J			CDS: 0.4 1-Chlorobutane: J 2-Hexanone: 0.5
	9/1/98	0.9	J	BD	BD	BD	J	BD	BD	
	9/10/98	0.4	BD	BD	BD	BD	J	BD	BD	2-Hexanone: J 1,4-DCB: J
	9/17/98	0.9	BD	BD	BD	BD	BD	BD	BD	
	9/24/98	0.9	BD	BD	BD	BD	BD	BD	BD	
	10/1/98	1.0	BD	BD	BD	BD	BD	BD	BD	
	10/15/98	0.6	BD	BD	BD	BD	BD	BD	BD	
	10/22/98	0.7	BD	BD	BD	BD	BD	BD	BD	
	10/27/98	1.1	BD	BD	BD	BD	BD	BD	BD	
	11/6/98	0.8	BD	BD	BD	BD	J	BD	BD	CDS: J
	11/19/98	1.0	BD	BD	BD	BD	J	BD	BD	
	11/23/98	1.1	BD	BD	BD	BD	0.6	BD	BD	Benzene: J DBM: 0.9 Chlorobenzene: J Styrene: J
	12/4/98	1.2	BD	BD	BD	BD	J	BD	BD	
	12/7/98	0.9	BD	BD	BD	BD	J	BD	BD	
	12/17/98	0.6	BD	BD	BD	BD	J	BD	BD	
	12/21/98	J	BD	BD	BD	BD	BD	BD	BD	

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)								
		Total Trihalo-methanes	Trichloro -ethylene	Tetra-chloro-ethylene	1,1,1-Trichloro -ethane	1,2-Dichloro-ethane	MTBE	Xylenes	Toluene	Other Volatile Organic Chemicals
		MCL = 100	MCL = 1	MCL = 1	MCL = 30	MCL = 2	MCL = 70	MCL = 1,000	MCL = 1,000	See Notes for Abbreviations and MCLs
POE 7: Parkway, continued	1/6/99	2.3	BD	BD	BD	BD	J	BD	BD	
	1/14/99	1.9	BD	BD	BD	BD	J	BD	BD	2-Hexanone: J
	1/20/99	1.1	BD	BD	BD	BD	J	BD	BD	MC: J
	1/27/99	1.3	BD	BD	BD	BD	J	BD	BD	
	2/2/99	2.3	BD	BD	BD	BD	J	BD	BD	
	2/10/99	1.1	BD	BD	BD	BD	BD	BD	BD	1,1-DCPone: J
	2/17/99	J	BD	BD	BD	BD	BD	BD	BD	
	2/25/99	1.7	BD	BD	BD	BD	J	BD	BD	
	3/3/99	1.3	BD	BD	BD	BD	BD	BD	BD	
	3/12/99	2.0	BD	BD	BD	BD	J	BD	BD	
	3/17/99	0.7	BD	BD	BD	BD	BD	BD	BD	
	3/24/99	2.0	BD	BD	BD	BD	J	BD	BD	
	3/31/99	3.3	BD	BD	BD	BD	BD	BD	BD	Naphthalene: 3.1
	4/7/99	1.9	BD	BD	BD	BD	J	BD	BD	4M2P: J
	4/14/99	1.5	BD	BD	BD	BD	J	BD	BD	
	4/21/99	2.8	BD	BD	BD	BD	J	BD	BD	
	4/28/99	1.5	BD	BD	BD	BD	BD	BD	BD	4M2P: J
	5/5/99	2.1	BD	BD	BD	BD	BD	BD	BD	
	5/12/99	2.4	BD	BD	BD	BD	BD	BD	BD	
	5/19/99	3.0	BD	BD	BD	BD	BD	BD	BD	
	5/26/99	3.5	BD	BD	BD	BD	J	BD	BD	4M2P: J
	6/2/99	J	BD	BD	BD	BD	BD	BD	BD	
	6/9/99	0.5	BD	BD	BD	BD	BD	BD	BD	
	6/16/99	0.4	BD	BD	BD	BD	BD	BD	BD	
	6/23/99	1.4	BD	BD	BD	BD	BD	BD	BD	
	6/30/99	1.0	BD	BD	BD	BD	BD	BD	BD	

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)								
		Total Trihalo-methanes	Trichloro-ethylene	Tetra-chloro-ethylene	1,1,1-Trichloro-ethane	1,2-Dichloro-ethane	MTBE	Xylenes	Toluene	Other Volatile Organic Chemicals
		MCL = 100	MCL = 1	MCL = 1	MCL = 30	MCL = 2	MCL = 70	MCL = 1,000	MCL = 1,000	See Notes for Abbreviations and MCLs
Well 22	4/4/96	BD	BD	BD	BD	BD	BD	BD	BD	
	5/27/97	1.0	BD	BD	BD	BD	BD	BD	BD	
	6/24/97	BD	BD	BD	BD	BD	BD	BD	BD	
	7/2/97	BD	BD	BD	BD	BD	BD	BD	BD	
	7/17/97	BD	BD	BD	BD	BD	BD	BD	BD	
	7/30/97	BD	BD	BD	BD	BD	BD	BD	BD	
	8/14/97	0.4	BD	BD	BD	BD	BD	BD	BD	
	8/26/97	BD	BD	BD	BD	BD	BD	BD	BD	
	9/9/97	0.4	BD	BD	0.1	BD	BD	BD	BD	
	10/6/97	0.4	BD	BD	BD	BD	BD	BD	BD	
	11/17/97	J	BD	BD	BD	BD	BD	BD	BD	
	12/15/97	J	BD	BD	BD	BD	BD	BD	BD	
	2/4/98	BD	BD	BD	BD	BD	BD	BD	BD	
	2/10/98	BD	BD	BD	BD	BD	BD	BD	BD	
	4/1/98	0.3	BD	BD	0.2	BD	BD	BD	BD	
	7/8/98	BD	BD	BD	BD	BD	J	BD	BD	
	8/21/98	0.4	BD	BD	BD	0.3	J	BD	BD	CDS: J 1-Chlorobutane: J 2-Hexanone: 1.0
	9/1/98	0.3	BD	BD	BD	BD	J	BD	BD	
	9/10/98	0.3	BD	BD	BD	BD	J	BD	BD	
	9/17/98	0.4	BD	BD	BD	BD	BD	BD	BD	
	9/24/98	0.3	BD	BD	BD	BD	J	BD	BD	
	10/1/98	0.3	BD	BD	BD	BD	BD	BD	BD	
	10/8/98	0.3	BD	BD	BD	BD	BD	BD	BD	
	11/6/98	0.3	BD	BD	BD	BD	J	BD	BD	CDS: J
	11/19/98	0.3	BD	BD	BD	BD	J	BD	BD	
	11/23/98	0.3	BD	BD	BD	BD	J	BD	BD	
	12/4/98	0.3	BD	BD	BD	BD	J	BD	BD	
	12/7/98	0.3	BD	BD	BD	BD	J	BD	BD	

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)								
		Total Trihalo-methanes	Trichloro -ethylene	Tetra-chloro-ethylene	1,1,1-Trichloro -ethane	1,2-Dichloro-ethane	MTBE	Xylenes	Toluene	Other Volatile Organic Chemicals
		MCL = 100	MCL = 1	MCL = 1	MCL = 30	MCL = 2	MCL = 70	MCL = 1,000	MCL = 1,000	See Notes for Abbreviations and MCLs
Well 22, continued	1/6/99	0.3	BD	BD	BD	BD	J	BD	BD	MC: J
	1/14/99	0.3	BD	BD	BD	BD	J	BD	BD	2-Hexanone: J
	1/20/99	J	BD	BD	BD	BD	J	BD	BD	
	1/27/99	0.3	BD	BD	BD	BD	J	BD	BD	
	2/2/99	0.3	BD	BD	BD	BD	J	BD	BD	
	2/10/99	BD	BD	BD	BD	BD	J	BD	BD	
	2/17/99	BD	BD	BD	BD	BD	J	BD	BD	
	2/25/99	0.3	BD	BD	BD	BD	J	BD	BD	
	3/3/99	0.3	BD	BD	BD	BD	J	BD	BD	
	3/12/99	0.3	BD	BD	BD	BD	J	BD	BD	
	3/17/99	0.4	BD	BD	BD	BD	J	BD	BD	
	3/24/99	J	BD	BD	BD	BD	J	BD	BD	
	3/31/99	2.0	BD	BD	BD	BD	BD	BD	BD	
	4/7/99	0.4	BD	BD	BD	BD	J	BD	BD	
	4/14/99	J	BD	BD	BD	BD	J	BD	BD	
	4/21/99	0.4	BD	BD	BD	BD	J	BD	BD	
	5/5/99	0.3	BD	BD	BD	BD	J	BD	BD	
	5/12/99	J	BD	BD	BD	BD	J	BD	BD	
	5/19/99	4.9	BD	BD	BD	BD	BD	BD	BD	
	5/26/99	0.4	BD	BD	BD	BD	J	BD	BD	
	6/2/99	0.4	BD	BD	BD	BD	J	BD	BD	4M2P: J
	6/9/99	0.4	BD	BD	BD	BD	J	BD	BD	
	6/16/99	J	BD	BD	BD	BD	J	BD	BD	
	6/23/99	0.4	BD	BD	BD	BD	BD	BD	BD	
	6/30/99	0.4	BD	BD	BD	BD	BD	BD	BD	

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)								
		Total Trihalo-methanes	Trichloro-ethylene	Tetra-chloro-ethylene	1,1,1-Trichloro-ethane	1,2-Dichloro-ethane	MTBE	Xylenes	Toluene	Other Volatile Organic Chemicals
		MCL = 100	MCL = 1	MCL = 1	MCL = 30	MCL = 2	MCL = 70	MCL = 1,000	MCL = 1,000	See Notes for Abbreviations and MCLs
Well 24	10/10/96	BD	BD	BD	BD	BD	BD	BD	BD	
	5/27/97	2.0	BD	BD	BD	BD	BD	BD	BD	
	6/24/97	BD	BD	BD	BD	BD	BD	BD	BD	
	7/2/97	BD	BD	BD	BD	BD	BD	BD	BD	Diethyl ether: J
	7/17/97	BD	BD	BD	BD	BD	BD	BD	BD	
	7/30/97	BD	BD	BD	BD	BD	BD	BD	BD	
	8/14/97	BD	BD	0.6	BD	BD	BD	BD	BD	
	8/26/97	BD	BD	BD	BD	BD	BD	BD	BD	
	9/9/97	J	BD	BD	BD	BD	BD	BD	BD	
	10/6/97	J	BD	BD	BD	BD	BD	BD	BD	
	11/17/97	BD	BD	BD	BD	BD	BD	0.4	BD	
	2/10/98	BD	BD	BD	BD	BD	BD	BD	BD	
	4/1/98	BD	BD	BD	0.5	BD	BD	BD	BD	
	7/8/98	BD	BD	BD	BD	BD	BD	BD	BD	
	8/21/98	BD	BD	BD	BD	BD	BD	BD	BD	CDS: J 2-Hexanone: J
	10/8/98	BD	BD	BD	BD	BD	BD	BD	BD	
	3/12/99	BD	BD	BD	BD	BD	BD	BD	BD	
	6/16/99	BD	BD	BD	BD	BD	BD	BD	BD	
Well 26 #	4/4/96	0.4	5.0	0.8	2.0	0.8	3.0	BD	BD	
Well 28 #	4/4/96	BD	8.0	0.8	BD	BD	0.3	BD	BD	
Wells 26+28 after air stripper #	4/4/96	BD	BD	BD	BD	0.3	1.0	BD	BD	

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)								
		Total Trihalo-methanes	Trichloro-ethylene	Tetra-chloro-ethylene	1,1,1-Trichloro-ethane	1,2-Dichloro-ethane	MTBE	Xylenes	Toluene	Other Volatile Organic Chemicals
		MCL = 100	MCL = 1	MCL = 1	MCL = 30	MCL = 2	MCL = 70	MCL = 1,000	MCL = 1,000	See Notes for Abbreviations and MCLs
Well 29	4/4/96	BD	2.0	BD	BD	BD	BD	BD	BD	
	5/27/97	BD	BD	BD	BD	BD	BD	BD	BD	
	6/24/97	BD	BD	BD	BD	BD	BD	BD	BD	Diethyl ether: J
	7/2/97	BD	BD	BD	BD	BD	BD	BD	BD	
	7/17/97	BD	BD	BD	BD	BD	BD	BD	BD	t-1,3-DCP: 0.3 DBM: 0.6 Bromobenzene: 0.5
	7/30/97	BD	BD	BD	BD	BD	BD	BD	BD	
	8/14/97	BD	BD	BD	BD	BD	BD	BD	BD	
	8/26/97	BD	BD	BD	BD	BD	BD	BD	BD	
	9/9/97	BD	J	BD	BD	BD	BD	BD	BD	MC: J
	10/6/97	BD	J	BD	BD	BD	BD	BD	BD	
	11/17/97	BD	BD	BD	BD	BD	BD	BD	BD	
	12/15/97	BD	BD	BD	BD	BD	BD	BD	BD	
	2/10/98	BD	BD	BD	BD	BD	BD	BD	BD	
	4/1/98	BD	BD	BD	BD	BD	BD	BD	BD	
	7/8/98	BD	0.8	BD	BD	BD	BD	BD	BD	
	8/21/98	BD	0.7	BD	BD	J	J	BD	BD	CDS: 2.0 1,1-DCA: J 2-Hexanone: 0.6
	9/1/98	BD	0.6	BD	BD	BD	J	BD	BD	
	9/10/98	BD	J	BD	BD	BD	J	BD	BD	DCDFM: J Benzene: J
	9/17/98	BD	BD	BD	BD	BD	BD	BD	BD	
	9/24/98	BD	BD	BD	BD	BD	BD	BD	BD	
	10/1/98	BD	BD	BD	BD	BD	BD	BD	BD	
	10/8/98	BD	BD	BD	BD	BD	BD	BD	BD	
	10/15/98	BD	BD	BD	BD	BD	BD	BD	BD	
	10/22/98	BD	BD	BD	BD	BD	BD	BD	BD	
	10/27/98	BD	BD	BD	BD	BD	BD	BD	BD	

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)								
		Total Trihalo-methanes	Trichloro -ethylene	Tetra-chloro-ethylene	1,1,1-Trichloro -ethane	1,2-Dichloro-ethane	MTBE	Xylenes	Toluene	Other Volatile Organic Chemicals
		MCL = 100	MCL = 1	MCL = 1	MCL = 30	MCL = 2	MCL = 70	MCL = 1,000	MCL = 1,000	See Notes for Abbreviations and MCLs
Well 29, continued	11/19/98	BD	BD	BD	BD	BD	BD	BD	BD	
	11/23/98	BD	BD	BD	BD	BD	BD	BD	BD	
	12/4/98	BD	BD	BD	BD	BD	BD	BD	BD	
	12/7/98	BD	BD	BD	BD	BD	BD	BD	BD	
	12/17/98	BD	BD	BD	BD	BD	BD	BD	BD	
	12/21/98	BD	BD	BD	BD	BD	BD	BD	BD	
	1/6/99	BD	BD	BD	BD	BD	BD	BD	BD	
	1/14/99	BD	BD	BD	BD	BD	BD	BD	BD	2-Hexanone: J
	1/20/99	BD	BD	BD	BD	BD	BD	BD	BD	
	1/27/99	BD	BD	BD	BD	BD	BD	BD	BD	
	2/2/99	BD	BD	BD	BD	BD	BD	BD	BD	
	2/10/99	BD	BD	BD	BD	BD	BD	BD	BD	
	2/17/99	BD	BD	BD	BD	BD	BD	BD	BD	
	2/25/99	BD	BD	BD	BD	BD	BD	BD	BD	
	3/3/99	BD	BD	BD	BD	BD	BD	BD	BD	
	3/12/99	J	BD	BD	BD	BD	BD	BD	BD	
	3/17/99	BD	BD	BD	BD	BD	BD	BD	BD	
	3/24/99	BD	BD	BD	BD	BD	BD	BD	BD	
	3/31/99	BD	BD	BD	BD	BD	BD	BD	BD	
	4/7/99	BD	BD	BD	BD	BD	BD	BD	BD	
	4/14/99	BD	BD	BD	BD	BD	BD	BD	BD	
	4/28/99	BD	BD	BD	BD	BD	BD	BD	BD	
	5/5/99	BD	BD	BD	BD	J	BD	BD	BD	
	5/12/99	BD	BD	BD	BD	BD	BD	BD	BD	
	5/19/99	BD	BD	BD	BD	BD	BD	BD	BD	
	5/26/99	BD	BD	BD	BD	BD	BD	BD	BD	
	6/2/99	BD	BD	BD	BD	BD	BD	BD	BD	
	6/9/99	BD	BD	BD	BD	BD	BD	BD	BD	
	6/16/99	BD	BD	BD	BD	BD	BD	BD	BD	
	6/23/99	BD	BD	BD	BD	BD	BD	BD	BD	

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)								
		Total Trihalo-methanes	Trichloro-ethylene	Tetra-chloro-ethylene	1,1,1-Trichloro-ethane	1,2-Dichloro-ethane	MTBE	Xylenes	Toluene	Other Volatile Organic Chemicals
		MCL = 100	MCL = 1	MCL = 1	MCL = 30	MCL = 2	MCL = 70	MCL = 1,000	MCL = 1,000	See Notes for Abbreviations and MCLs
Well 39	8/21/96 7/23/97	BD BD	BD BD	BD BD	BD BD	BD BD	BD BD	BD BD	BD BD	
Well 41	8/21/96 7/23/97	BD BD	BD BD	BD BD	BD BD	BD BD	BD BD	BD BD	BD BD	
Well 42	4/4/96 4/2/97	BD BD	BD BD	BD BD	BD BD	BD BD	BD BD	BD BD	BD BD	

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)								
		Total Trihalo-methanes	Trichloro -ethylene	Tetra-chloro-ethylene	1,1,1-Trichloro -ethane	1,2-Dichloro-ethane	MTBE	Xylenes	Toluene	Other Volatile Organic Chemicals
		MCL = 100	MCL = 1	MCL = 1	MCL = 30	MCL = 2	MCL = 70	MCL = 1,000	MCL = 1,000	See Notes for Abbreviations and MCLs
Well 44	10/10/96	J	BD	BD	BD	BD	BD	BD	BD	
	5/15/97	4.0	BD	BD	BD	BD	BD	BD	BD	
	5/27/97	2.0	BD	BD	BD	BD	BD	BD	BD	
	6/5/97	2.0	BD	BD	BD	BD	BD	BD	BD	
	6/24/97	BD	BD	BD	BD	BD	BD	BD	BD	
	7/2/97	BD	BD	BD	BD	BD	BD	BD	BD	
	7/17/97	BD	BD	BD	BD	BD	BD	BD	BD	
	7/30/97	BD	BD	BD	BD	BD	BD	BD	BD	
	8/14/97	BD	BD	BD	BD	BD	BD	BD	BD	
	8/26/97	BD	BD	BD	BD	BD	BD	BD	BD	
	9/9/97	0.5	BD	BD	BD	BD	BD	BD	BD	
	10/6/97	0.5	BD	BD	BD	BD	J	BD	BD	
	11/17/97	J	BD	BD	BD	BD	BD	BD	BD	
	12/15/97	BD	BD	BD	BD	BD	BD	BD	BD	
	2/10/98	BD	BD	BD	BD	BD	BD	BD	BD	
	4/1/98	0.3	BD	BD	BD	BD	BD	BD	BD	
	7/8/98	BD	BD	BD	BD	BD	BD	BD	BD	
	8/21/98	0.3	BD	BD	BD	0.2	J	BD	BD	CDS: J 1-Chlorobutane: J 2-Hexanone: 0.8
	10/8/98	0.3	BD	BD	BD	BD	BD	BD	BD	
	3/12/99	J	BD	BD	BD	BD	J	BD	BD	
	6/16/99	BD	BD	BD	BD	BD	BD	BD	BD	
Well 45	2/11/98	BD	BD	BD	BD	BD	BD	BD	BD	
POE 12: Windsor	6/17/96	BD	BD	BD	BD	BD	BD	BD	BD	
	7/8/96	BD	BD	BD	BD	BD	BD	BD	BD	

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)								
		Total Trihalo-methanes	Trichloro-ethylene	Tetra-chloro-ethylene	1,1,1-Trichloro-ethane	1,2-Dichloro-ethane	MTBE	Xylenes	Toluene	Other Volatile Organic Chemicals
		MCL = 100	MCL = 1	MCL = 1	MCL = 30	MCL = 2	MCL = 70	MCL = 1,000	MCL = 1,000	See Notes for Abbreviations and MCLs
Well 40	7/8/96 11/21/96	BD BD	BD BD	BD BD	BD BD	BD BD	BD BD	BD BD	BD BD	

BD = Below the method detection limit (MDL); MDLs for volatile organic chemicals may vary between chemicals and from analysis to analysis, but are in the range of 0.1 to 0.9 µg/l.

J: Chemical was detected in the sample, but at a level below the method detection limit.

MCL: Maximum Contaminant Level

Notes: MCLs for the following chemicals are: ethylbenzene, 700 µg/l; MC (methylene chloride), 2 µg/l; chlorobenzene, 50 µg/l; benzene, 1 µg/l; styrene, 100 µg/l; naphthalene, 300 µg/l; and 1,4-dichlorobenzene, 75 µg/l.

There are no established MCLs for: dichlorodifluoromethane (DCDFM); trichlorofluoromethane (TCFM); trans-1,3-dichloropropylene (t-1,3-DCP); 1,1-dichloropropanone (1,1-DCPone); 4-methyl-2-pentanone (4M2P); dibromomethane; bromobenzene; 4-chlorotoluene; carbon disulfide; 1-chlorobutane; 2-hexanone; and diethyl ether.

The NJDHSS reports experiencing sporadic contamination with acetone, chloromethane, and 2-butanone. Results for these chemicals are not reported in these tables. In addition, it should be noted that carbon disulfide, 2-hexanone 4-methyl-2-pentanone, and methylene chloride are commonly found in the trip and field blanks. Although values for these chemicals are reported in the tables (when not found in the blanks accompanying the samples), the presence of these chemicals in the source waters is doubtful.

Total trihalomethanes include chloroform, bromodichloromethane, dibromochloromethane and bromoform. Concentrations include the sum of all reported values above the method detection limit.

Xylenes include the sum of m/p-xylenes and o-xylene.

No other target organic chemicals (see Table 4 for lists) were detected in these samples.

Data for samples from wells 26 and 28 and air-stripped water are presented only for the time period prior to November 1996.

* Sample and reference spectra do not match.

** Laboratory unable to analyze sample.

Table 6c. Volatile organic chemical results, wells 26 and 28, after November 1996: United Water Toms River community water supply.

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)								
		Total Trihalo-methanes	Trichloro -ethylene	Tetra-chloro-ethylene	1,1,1-Trichloro -ethane	1,2-Dichloro-ethane	MTBE	1,1-Dichloro-ethane	cis-1,2-Dichloro-ethylene	Other Volatile Organic Chemicals
		MCL = 100	MCL = 1	MCL = 1	MCL = 30	MCL = 2	MCL = 70	MCL = 50	MCL = 70	See Notes for Abbreviations and MCLs
Well 26	7/17/97	BD	6.0	0.8	2.0	BD	0.7	BD	J	t-1,3-DCP: J
	8/12/97	0.4	5.0	0.7	1.0	0.6	0.6	BD	J	CT: J
	8/14/97	0.5	5.0	0.6	1.0	0.3	0.5	J	J	1,1-DCE: J
	8/19/97 **									
	9/2/97	0.4	5.0	BD	1.0	BD	J	BD	BD	
	9/9/97	0.4	4.2	0.5	1.5	0.4	0.8	0.2	BD	See Note A
	10/6/97	0.4	3.8	0.5	1.4	BD	BD	BD	BD	See Note B
	11/17/97	BD	3.2	0.4	1.4	BD	BD	BD	BD	
	12/15/97	BD	3.0	0.4	1.0	BD	BD	BD	BD	
	2/10/98	0.4	4.0	0.6	1.0	0.3	0.9	J	J	
	4/1/98	0.5	2.7	J	1.1	J	2.4	BD	BD	
	7/8/98	B*	3.0	J	1.0	0.2	1.0	J	J	
	8/10/98	0.5	2.6	J	BD	BD	J	BD	BD	
	10/8/98	0.5	2.8	J	1.1	0.2	1.2	BD	BD	
	6/9/99	0.5	2.1	J	0.9	BD	1.7	BD	BD	
	6/16/99	0.4	2.0	J	0.7	BD	1.0	J	J	

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)								
		Total Trihalo-methanes	Trichloro-ethylene	Tetra-chloro-ethylene	1,1,1-Trichloro-ethane	1,2-Dichloro-ethane	MTBE	1,1-Dichloro-ethane	cis-1,2-Dichloro-ethylene	Other Volatile Organic Chemicals
		MCL = 100	MCL = 1	MCL = 1	MCL = 30	MCL = 2	MCL = 70	MCL = 50	MCL = 70	See Notes for Abbreviations and MCLs
Well 28	7/17/97	0.6	2.0	BD	BD	BD	BD	BD	BD	
	8/12/97	0.6	2.0	BD	BD	0.4	BD	BD	BD	CT: J
	8/14/97	0.7	2.0	BD	BD	BD	BD	BD	BD	
	8/19/97 **									
	9/2/97	0.7	2.0	BD	BD	0.3	J	BD	BD	
	9/9/97	0.7	2.5	J	0.1	BD	J	BD	BD	See Note C
	10/6/97	0.7	3.0	J	0.1	BD	BD	BD	BD	
	11/17/97	BD	BD	BD	BD	BD	BD	BD	BD	
	12/15/97	0.6	2.2	J	BD	BD	J	BD	BD	
	2/10/98	0.5	3.0	BD	BD	BD	J	BD	BD	
	4/1/98	0.7	2.7	J	BD	BD	BD	BD	BD	
	7/8/98	B*	3.0	J	BD	BD	J	BD	BD	
	8/10/98	0.5	2.7	J	BD	BD	J	BD	BD	
	10/8/98	0.6	4.0	J	BD	BD	BD	BD	BD	
	6/9/99	0.6	3.2	0.4	0.3	BD	0.8	BD	BD	
	6/16/99	0.4	3.0	0.6	J	BD	0.6	J	BD	2-Hexanone: 0.5

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)								
		Total Trihalo-methanes	Trichloro -ethylene	Tetra-chloro-ethylene	1,1,1-Trichloro -ethane	1,2-Dichloro-ethane	MTBE	1,1-Dichloro-ethane	cis-1,2-Dichloro-ethylene	Other Volatile Organic Chemicals
		MCL = 100	MCL = 1	MCL = 1	MCL = 30	MCL = 2	MCL = 70	MCL = 50	MCL = 70	See Notes for Abbreviations and MCLs
Combined effluent of wells 26 + 28, after full GAC treatment	7/17/97	BD	BD	BD	BD	BD	BD	BD	BD	
	8/12/97	BD	BD	BD	BD	BD	BD	BD	BD	CT: 0.5
	8/14/97	BD	BD	BD	BD	BD	BD	BD	BD	
	8/19/97 **									
	8/26/97	BD	BD	BD	BD	BD	BD	BD	BD	
	9/2/97	BD	BD	BD	BD	BD	BD	BD	BD	
	9/9/97	BD	BD	BD	BD	BD	BD	BD	BD	
	9/24/97	BD	BD	BD	BD	BD	J	BD	BD	
	10/6/97	BD	BD	BD	BD	BD	BD	BD	BD	
	11/17/97	BD	BD	BD	BD	BD	BD	BD	BD	
	12/15/97	BD	BD	BD	BD	BD	BD	BD	BD	
	2/10/98	BD	BD	BD	BD	BD	J	BD	BD	
	4/1/98	BD	BD	BD	BD	BD	BD	BD	BD	
	7/8/98	BD	BD	BD	BD	BD	J	BD	BD	
	8/10/98	BD	BD	BD	BD	BD	0.8	BD	BD	
	10/8/98	BD	BD	BD	BD	BD	1.1	BD	BD	
	6/9/99	BD	BD	BD	BD	BD	BD	BD	BD	
	6/16/99	BD	BD	BD	BD	BD	BD	BD	BD	

BD: Below the method detection limit (MDL); MDLs for volatile organic chemicals may vary between chemicals and from analysis to analysis, but are generally between 0.1 and 1.0 µg/l.

B* Chloroform was measured in samples at levels consistent with previous and later samples, but also was found in the trip and/or field blank.

J: Chemical was detected in the sample, but at a level below the method detection limit.

GAC: Granular activated carbon treatment

MCL: Maximum Contaminant Level

Notes: MCLs for the following chemicals are: carbon tetrachloride (CT), 2 µg/l; 1,1-dichloroethylene (1,1-DCE), 2 µg/l; 1,3-dichlorobenzene (1,3-DCB), 600 µg/l; 1,4-dichlorobenzene (1,4-DCB), 75 µg/l; and chlorobenzene, 50 µg/l. There are no MCLs for the following chemicals: trans-1,3-dichloropropylene (t-1,3-DCP), 2-hexanone, and trichlorofluoromethane (TCFM).

A. Sample also reported to contain: chlorobenzene, 0.05 µg/l; TCFM, J; 1,1-DCE, 0.3 µg/l; carbon disulfide, J; 1,3-DCB, J; and 1,4-DCB, J.

B. Sample also reported to contain: chlorobenzene, J; 1,1-DCE, 0.3 µg/l; and 1,3-DCB, J.

C. Sample also reported to contain: chlorobenzene, J; carbon disulfide, J; and 1,4-DCB, J.

The NJDHSS reports experiencing sporadic contamination with acetone, chloromethane, and 2-butanone. Results for these chemicals are not reported in these tables. In addition, it should be noted that carbon disulfide and 2-hexanone are commonly found in the trip and field blanks. Although values for these chemical are reported in the tables (when not found in the blanks accompanying the samples), there is reason to doubt its presence in the source waters.

Total trihalomethanes include chloroform, bromodichloromethane, dibromochloromethane and bromoform. Concentrations include the sum of all reported values above the method detection limit.

No other target organic chemicals (see Table 4 for lists) were detected in these samples.

** Results invalid due to laboratory cross-contamination of samples.

Table 6d. Volatile organic chemical results, comparison samples.

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)								
		Total Trihalo-methanes	Trichloro-ethylene	Tetra-chloro-ethylene	1,1,1-Trichloro-ethane	1,2-Dichloro-ethane	MTBE	Xylenes	Toluene	Other Volatile Organic Chemicals
		MCL = 100	MCL = 1	MCL = 1	MCL = 30	MCL = 2	MCL = 70	MCL = 1,000	MCL = 1,000	See Notes for Abbreviations and MCLs
Beachwood Elementary (Beachwood)	3/28/96	3.3	BD	BD	BD	BD	BD	BD	BD	
Pine Beach Elementary (Pine Beach)	3/28/96	2.5	BD	BD	BD	BD	BD	BD	BD	
Cedar Glen #2 (Manchester)	5/6/96	0.4	BD	BD	BD	BD	BD	BD	BD	
Crestwood Village #4 (Manchester)	5/6/96	1.1	BD	J	0.6	0.5	0.2	BD	BD	
Crestwood Village #5 (Manchester)	5/6/96	0.4	BD	BD	BD	BD	BD	BD	BD	
Norm's Dale (Egg Harbor)	5/1/96	2.0	BD	BD	BD	BD	BD	BD	BD	
Great Bear (Bottled Water)	5/1/96	BD	BD	BD	BD	BD	BD	J	BD	TBA: 4.0 *

BD: Below the method detection limit (MDL); MDLs for volatile organic chemicals may vary between chemicals and from analysis to analysis, but are generally between 0.1 and 1.0 µg/l.

J: Chemical was detected in the sample, but at a level below the method detection limit.

MCL: Maximum Contaminant Level

TBA: Tertiary-butyl alcohol

Notes: There is no MCL for tertiary-butyl alcohol (TBA).

Total trihalomethanes include chloroform, bromodichloromethane, dibromochloromethane and bromoform. Concentrations include the sum of all reported values above the method detection limit.

Xylenes include the sum of m/p-xylenes and o-xylene.

No other target organic chemicals (see Table 4 for lists) were detected in these samples.

* Sample and reference spectra do not match.

Table 7a. Other organic chemical results, distribution (school) samples: United Water Toms River community water supply, March 1996 through December 1998. Results from methods 525.2, 625, 507, 504, 505, 515, 531, and/or LC-MS. (See Table 3 for details of methods used on each sample.)

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)		
		Styrene-Acrylonitrile Trimer @	Polycyclic Aromatic Hydrocarbons (PAHs)	Phthalates and Adipates (> 2 µg/l) #
Toms River High School East	3/28/96	Present	BD	BD
Toms River High School North	3/28/96	Present	BD	BD
Toms River High School South	3/28/96 4/9/96	** Absent	** BD	** BD
Alternate Learning Center	3/28/96	Absent	Fluorene*: 0.05	BD
Toms River Intermediate East	3/28/96	Present	BD	BD
Toms River Intermediate West	3/28/96 4/4/96	Present Present	BD BD	BD BD
Cedar Grove Elementary	3/28/96 4/1/96 ***	Present Anr	BD Anr	BD Anr
East Dover Elementary	3/28/96 4/4/96 4/24/96 8/27/96 ##	Present Present Anr Anr	BD BD BD Anr	BD BD BD Anr
Hooper Ave. Elementary	3/28/96	Present	BD	BD
North Dover Elementary	3/28/96	Present	BD	BD
Silver Bay Elementary	3/28/96	Present	BD	BD
South Toms River Elementary	3/28/96	Absent	Fluorene*: 0.04	BD
Walnut St. Elementary	3/28/96	Present	BD	BD
Washington St. Elementary	3/28/96	Present	BD	BD
West Dover Elementary	3/28/96 4/24/96 8/27/96 ##	Present Anr Anr	BD BD Anr	BD BD Anr
Toms River Schools Admin. Bldg. – Special Education	3/28/96	Present	BD	BD
Ambassador Christian Academy	3/28/96	Absent	BD	BD

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)		
		Styrene-Acrylonitrile Trimer @	Polycyclic Aromatic Hydrocarbons (PAHs)	Phthalates and Adipates (> 2 µg/l) #
Ocean County College	3/28/96	Present	BD	BD
Ocean County VoTech	3/28/96	Present	BD	BD
St. Joseph Elementary	3/28/96	Present	BD	BD
Monsignor Donovan High School	3/28/96	Present	BD	BD

BD: All other target analytes (see Table 4 for lists) were below the method detection limit (MDL); MDLs for organic chemicals may vary between chemicals, from analysis to analysis, and between methods.

J: Chemical was detected in the sample, but at a level below the method detection limit.

Anr: Analysis not requested.

Notes: There are no established Maximum Contaminant Levels (MCLs) for styrene-acrylonitrile trimer and fluorene. The ATSDR health-based guidance level for fluorene is 400 µg/l.

A variety of phthalates were found in several samples. However, these chemicals are common and sporadic laboratory contaminants at low levels, frequently appearing in trip, field, and laboratory reagent blanks. In the laboratory data package volumes, the NJDHSS Laboratory states that phthalate levels of less than 2 or 3 µg/l are suspect. For this reason, only concentrations exceeding 2 µg/l are reported in these tables.

@ Styrene-acrylonitrile (SAN) trimer was first identified in November 1996, in samples taken in March and April 1996. Prior to May 1997, when analytical methods were adapted specifically to measure SAN trimer, the possible presence or absence, but not the amount of SAN trimer could be determined. In this table, SAN trimer in samples before May 1997 is reported as “Present” if the sample showed 1, 2 or 3 of the 3 characteristic ion peaks, or “Absent” otherwise. The updated analytical method requires 2 of the 3 characteristic ion peaks for SAN trimer to be considered detected, so the occurrence of SAN trimer in samples prior to May 1997 may be overstated.

* Sample and reference spectra do not match.

** Laboratory unable to analyze sample; location re-sampled for analyses.

*** Re-sample for Method 505 analysis only; all target analytes BD.

Sample analyzed using LC-MS methods only. No analytes detected.

Table 7b. Other organic chemical results, point of entry and well samples: United Water Toms River community water supply, March 1996 through December 1998. Results from methods 525.2, 625, 507, 504, 505, 515, 531, and/or LC-MS. (See Table 3 for details of methods used on each sample.)

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)		
		Styrene-Acrylonitrile Trimer @	Polycyclic Aromatic Hydrocarbons (PAHs)	Phthalates and Adipates (> 2 µg/l) ##
POE 1: Holly	4/24/96	Absent	BD	BD
Well 21	8/21/96 12/9/96	Absent Absent	BD BD	BD BD
Well 30	4/24/96 8/27/96 11/21/96	Absent Absent Absent	BD Anr BD	BD Anr BD
Well 37	8/21/96 12/9/96	Absent Absent	BD BD	BD BD
POE 2: Brookside	6/17/96 7/8/96	Absent Absent	BD BD	BD BD
Well 15	7/8/96 6/5/97	Absent BD	BD BD	BD BD
Well 43	4/2/97 4/23/97 5/27/97 ###	** BD Anr	** BD Anr	BD BD Anr
POE 3: South Toms River	4/4/96 4/24/96	Absent Anr	Fluorene*: 0.06 BD	BD BD
Well 32	4/4/96 8/27/96 12/9/96	Absent Absent Absent	Fluorene*: 0.06 Anr BD	BD Anr BD
Well 38	10/16/96 12/9/96	Absent Absent	BD BD	BD BD
POE 4: Indian Head	4/4/96 4/24/96	Present Anr	BD BD	BD BD

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)		
		Styrene-Acrylonitrile Trimer @	Polycyclic Aromatic Hydrocarbons (PAHs)	Phthalates and Adipates (> 2 µg/l) ##
Well 20	4/4/96	Present	BD	BD
	12/5/96	Absent	BD	BD
	5/27/97	BD	BD	BD
	6/24/97	BD	BD	BD
	7/2/97	BD	BD	BD
	7/17/97	BD	BD	BD
	8/26/97	BD	BD	BD
	9/9/97	BD	BD	BD
	10/6/97	BD	BD	BD
	11/17/97	BD	BD	BD
POE 5: Route 70	4/4/96	Absent	BD	BD
	4/24/96	Anr	BD	BD
Well 31	4/4/96	Absent	BD	BD
	8/27/96	Absent	Anr	Anr
	11/21/96	Absent	BD	BD
POE 6: Berkeley	4/4/96	Absent	Fluorene: J	BD
	4/24/96	Anr	BD	BD
Well 33	4/4/96	Absent	BD	BD
	7/8/96 ####	Anr	Anr	Anr
	8/27/96			
	11/21/96	Absent	Anr	Anr
		Absent	BD	BD
Well 34	8/27/96	Absent	Anr	Anr
	10/16/96	Absent	Naphthalene: 9.0	BD
			Fluorene*: 0.5	
			Phenanthrene*: 0.2	
	11/21/96	Absent	Fluorene: 0.3	BD
			Phenanthrene*: 0.1	
Well 35	7/8/96	Absent	BD	BD
	11/21/96	Absent	BD	BD

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)		
		Styrene-Acrylonitrile Trimer @	Polycyclic Aromatic Hydrocarbons (PAHs)	Phthalates and Adipates (> 2 µg/l) ##
POE 7: Parkway	4/4/96	Present	BD	BD
	4/24/96	Anr	BD	BD
	8/21/98	BD (H,L)	BD	BD
	9/1/98	***	***	***
	9/10/98	BD (H,L)	BD	BD
	9/17/98	BD (H,L)	BD	BD
	9/24/98	BD (H,L)	BD	BD
	10/1/98	BD	BD	BD
	10/15/98	BD (H,L)	BD	BD
	10/22/98	BD	BD	BD
	10/27/98	BD	BD	BD
	11/6/98	BD	BD	BD
	11/19/98	BD	BD	BD
	11/23/98	BD	BD	BD
	12/4/98	BD	BD	BD
	12/7/98	BD	BD	BD
	12/17/98	BD	BD	BD
	12/21/98	BD	BD	BD
POE: Parkway, continued	1/6/99	BD	BD	BD
	1/14/99	BD	BD	BD
	1/20/99	BD	BD	BD
	1/27/99	BD	BD	BD
	2/2/99	BD	BD	BD
	2/10/99	BD	BD	BD
	2/17/99	BD	BD	BD
	2/25/99	BD	BD	BD
	3/3/99	BD	BD	BD
	3/12/99	BD	Pyrene: J	BD
	3/17/99	BD	BD	BD
	3/24/99	BD	BD	BD
	3/31/99	BD	Fluorene: 0.1 Phenanthrene: 0.1	BD
	4/7/99	BD	BD	BD
	4/14/99	BD	BD	BD
	4/21/99 ***	BD	BD	BD
	4/28/99	BD	BD	BD
	5/5/99	BD	BD	BD
	5/12/99	BD	BD	BD
	5/19/99	BD	BD	BD
	5/26/99	BD	BD	BD
	6/2/99	BD	BD	BD
	6/9/99	BD	BD	BD
	6/16/99	BD	BD	BD
	6/23/99	BD	BD	BD
	6/30/99	BD	BD	BD

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)		
		Styrene-Acrylonitrile Trimer @	Polycyclic Aromatic Hydrocarbons (PAHs)	Phthalates and Adipates (> 2 µg/l) ##
Well 22	4/4/96	Absent	BD	BD
	5/27/97	BD	BD	BD
	6/24/97	BD	BD	BD
	7/2/97	BD	BD	BD
	7/17/97	BD	BD	BD
	7/30/97	BD	BD	BD
	8/14/97	BD	BD	BD
	8/26/97	BD	BD	BD
	9/9/97	BD	BD	BD
	10/6/97	BD	BD	BD
	11/17/97	BD	BD	BD
	12/15/97	BD	BD	BD
	2/4/98	BD	BD	BD
	2/10/98	BD	BD	BD
	4/1/98	BD	BD	BD
	7/8/98	BD	BD	BD
	8/21/98	BD	BD	BD
	9/1/98	BD (H,L)	BD	BD
	9/10/98	BD (H,L)	BD	BD
	9/17/98	BD	BD	BD
	9/24/98	BD	BD	BD
	10/1/98	BD	BD	BD
	10/8/98	BD	BD	BD
	11/6/98	BD	BD	BD
	11/19/98	BD	BD	BD
	11/23/98	BD	BD	BD
	12/4/98	BD	BD	BD
	12/7/98	BD	BD	BD
	12/17/98	BD	BD	BD
	12/21/98	BD	BD	BD

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)		
		Styrene-Acrylonitrile Trimer @	Polycyclic Aromatic Hydrocarbons (PAHs)	Phthalates and Adipates (> 2 µg/l) ##
Well 22, continued	1/6/99	BD	BD	BD
	1/14/99	BD	BD	BD
	1/20/99	BD	BD	BD
	1/27/99	BD	BD	BD
	2/2/99	BD	BD	BD
	2/10/99	BD	BD	BD
	2/17/99	BD	BD	BD
	2/25/99	BD	BD	BD
	3/3/99	BD	BD	BD
	3/12/99	BD	BD	BD
	3/17/99	BD	BD	BD
	3/24/99	BD	BD	BD
	3/31/99 ***	BD	BD	BD
	4/7/99	BD	BD	BD
	4/14/99	BD	BD	BD
	4/21/99 ***	BD	BD	BD
	5/5/99	BD	BD	BD
	5/12/99	BD	BD	BD
	5/19/99	BD	BD	BD
	5/26/99	BD	BD	BD
	6/2/99	BD	BD	BD
	6/9/99	BD	BD	BD
	6/16/99	BD	BD	BD
	6/23/99	BD	BD	BD
	6/30/99	BD	BD	BD

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)		
		Styrene-Acrylonitrile Trimer @	Polycyclic Aromatic Hydrocarbons (PAHs)	Phthalates and Adipates (> 2 µg/l) ##
Well 24	8/27/96	Absent	Anr	Anr
	10/10/96	Absent	BghiP*: 0.3	BD
	5/27/97	BD	BD	BD
	6/24/97	BD	BD	BD
	7/2/97	BD	BD	BD
	7/17/97	BD	BD	BD
	7/30/97	BD	BD	BD
	8/14/97	BD	BD	BD
	8/26/97	BD	BD	BD
	8/27/97	BD	BD	BD
	9/9/97	BD	BD	BD
	10/6/97	BD	BD	BD
	11/17/97	BD	Fluorene: 0.2 Phenanthrene: 1.0 Anthracene: 0.2 Pyrene: 0.3	BD
	2/10/98	BD	Pyrene: J	BD
	4/1/98	BD	BD	BD
	7/8/98	BD	BD	BD
	8/21/98	BD (H,L)	BD	BD
	10/8/98	BD	BD	BD
	3/12/99 **			
	3/17/99	BD	BD	BD
	6/16/99	BD	BD	BD
Well 26 #	4/4/96	Present	BD	BD
	8/27/96	Present	Anr	Anr
Well 28 #	4/4/96	Present	BD	BD
	8/27/96	Present	Anr	Anr
Wells 26+28 after air stripper #	4/4/96	Present	BD	BD

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)		
		Styrene-Acrylonitrile Trimer @	Polycyclic Aromatic Hydrocarbons (PAHs)	Phthalates and Adipates (> 2 µg/l) ##
Well 29	4/4/96	Present	BD	BD
	8/27/96	Present	Anr	Anr
	10/16/96	BD	BD	BD
	5/27/97	BD	BD	BD
	6/24/97	BD	BD	BD
	7/2/97	BD	BD	BD
	7/17/97	BD	BD	BD
	7/30/97	BD	BD	BD
	8/14/97	BD	BD	BD
	8/27/97	BD	BD	BD
	9/9/97	BD	BD	BD
	10/6/97	BD	BD	BD
	11/17/97	BD	BD	BD
	12/15/97	BD	BD	BD
	2/10/98	BD	BD	BD
	4/1/98	BD	BD	BD
	7/8/98	J	BD	BD
	8/21/98	BD (H) J (L)	BD	BD
	9/1/98	BD H) J (L)	BD	BD
	9/10/98	BD (H,L)	BD	BD
	9/17/98	BD (H,L)	BD	BD
	9/24/98	BD (H,L)	BD	BD
	10/1/98	BD	BD	BD
	10/8/98	BD (H,L)	BD	BD
	10/15/98	BD (H,L)	BD	BD
	10/22/98	BD	BD	BD
	10/27/98	BD	BD	BD
	11/6/98	BD	BD	BD
	11/19/98	BD	BD	BD
	11/26/98	BD	BD	BD
	12/4/98	BD	BD	BD
	12/7/98	BD	BD	BD
	12/17/98	BD	BD	BD
	12/21/98	BD	BD	BD

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)		
		Styrene-Acrylonitrile Trimer @	Polycyclic Aromatic Hydrocarbons (PAHs)	Phthalates and Adipates (> 2 µg/l) ##
Well 29, continued	1/6/99	BD	BD	BD
	1/14/99	BD	BD	BD
	1/20/99	BD	BD	BD
	1/27/99	BD	BD	BD
	2/2/99	BD	BD	BD
	2/10/99	J	BD	BD
	2/17/99	BD	BD	BD
	2/25/99	BD	BD	BD
	3/3/99	BD	BD	BD
	3/12/99	BD	BD	BD
	3/17/99	BD	BD	BD
	3/24/99	BD	BD	BD
	3/31/99	BD	BD	BD
	4/7/99	BD	BD	BD
	4/14/99	BD	BD	BD
	4/28/99	BD	BD	BD
	5/5/99	BD	BD	BD
	5/12/99	BD	BD	BD
	5/19/99	BD	BD	BD
	5/26/99	BD	Phenanthrene: 0.1 Pyrene: 0.2	BD
	6/2/99	BD	Pyrene: J	BD
	6/9/99	BD	Pyrene: J	BD
	6/16/99	BD	BD	BD
	6/23/99	BD	BD	BD
	6/30/99	BD	BD	BD
Well 39	8/21/96	Absent	BD	BD
	7/23/97	BD	BD	BD
Well 41	8/21/96	Absent	BD	BD
	7/23/97	BD	BD	DNBP: 2.3
Well 42	4/4/96	Absent	BD	BD
	8/27/96 ####	Anr	Anr	Anr
	4/2/97	**	**	**
	4/22/97	**	**	**
	4/25/97	BD	BD	BD

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)		
		Styrene-Acrylonitrile Trimer @	Polycyclic Aromatic Hydrocarbons (PAHs)	Phthalates and Adipates (> 2 µg/l) ##
Well 44	10/10/96	Absent	BD	BD
	5/15/97	BD	BD	BD
	5/27/97	BD	BD	BD
	6/5/97	BD	BD	BD
	6/24/97	BD	BD	BD
	7/2/97	BD	BD	BD
	7/17/97	BD	BD	BD
	7/30/97	BD	BD	BD
	8/14/97	BD	BD	BD
	8/26/97	BD	BD	BD
	8/27/97	BD	BD	BD
	9/9/97	BD	BD	BD
	10/6/97	BD	BD	BD
	11/17/97	BD	BD	BD
	12/15/97	BD	BD	BD
	2/10/98	BD	BD	BD
	4/1/98	BD	BD	BD
	7/8/98	BD	BD	BD
	8/21/98	BD (H,L)	BD	BD
	10/8/98	BD	BD	BD
	3/12/99	BD	BD	BD
	6/16/99	BD	BD	BD
Well 45	2/11/98	BD	BD	BD
POE 12: Windsor	6/17/96	Absent	BD	BD
	7/8/96	Absent	BD	BD
Well 40	7/8/96	Absent	BD	BD
	11/21/96	Absent	BaA* J BkF*: J	BD

BD: All other target analytes below the method detection limits (MDLs); MDLs for organic chemicals may vary between chemicals, from analysis to analysis, and between methods.

(H): Split sample analysis conducted by NJDHSS Laboratory. MDL for SAN trimer was 0.1 µg/l through December 1998, and 0.03 µg/l beginning in January 1999.

(L): Split sample analysis conducted by Lancaster Laboratories. MDL for SAN trimer was 0.01 µg/l.

J: Chemical was detected in the sample, but at a level below the method detection limit.

Anr: Analysis not requested.

Notes: Maximum Contaminant Levels (MCLs) for the following chemicals are: naphthalene, 300 µg/l.

There are no established MCLs for: styrene-acrylonitrile trimer or the following PAHs: fluorene, phenanthrene, pyrene, benzo[g,h,i]perylene (BghiP), anthracene, benz[a]anthracene (BaA), and benzo[k]fluoranthene (BkF). Health-based guidance levels set by ATSDR for these PAHs range from 300 to 3,000 µg/l. There is no MCL for di-n-butyl phthalate (DNBP), but the ATSDR health-based guidance level is 1,000 µg/l.

No other target organic chemicals (see Table 4 for lists) were detected in these samples.

@ Styrene-acrylonitrile (SAN) trimer was first identified in November 1996, in samples taken in March and April 1996. Prior to May 1997, when analytical methods were adapted specifically to measure SAN trimer, the possible presence or absence, but not the amount of SAN trimer could be determined. In this table, SAN trimer in samples before May 1997 is reported as "Present" if the sample showed 1, 2 or 3 of the 3 characteristic ion peaks, or "Absent" otherwise. The updated analytical method requires 2 of the 3 characteristic ion peaks for SAN trimer to be considered detected, so the occurrence of SAN trimer in samples prior to May 1997 may be overstated.

* Sample and reference spectra do not match.

** Laboratory unable to analyze sample.

*** Data rejected or qualified by laboratory due to inadequate sample preservation.

Data for samples from wells 26 and 28 and air-stripped water are presented only for the time period prior to November 1996.

A variety of phthalates were found in several samples. However, these chemicals are common and sporadic laboratory contaminants at low levels, frequently appearing in trip, field, and laboratory reagent blanks. In the laboratory data package volumes, the NJDHSS Laboratory states that phthalate levels of less than 2 or 3 µg/l are suspect. For this reason, only concentrations exceeding 2 µg/l are reported in these tables.

Sample analyzed using Method 505 only. No target analytes detected.

Sample analyzed using LC-MS methods only. No analytes detected.

Table 7c. Other organic chemical results, wells 26 and 28, after November 1996: United Water Toms River community water supply. Results from methods 525.2.

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)		
		Styrene-Acrylonitrile Trimer	Polycyclic Aromatic Hydrocarbons (PAHs)	Phthalates and Adipates (> 2 µg/l) #
Well 26	7/17/97	4.9	BD	BD
	8/12/97	4.5	BD	BD
	8/14/97	4.5	BD	BD
	8/19/97	4.1	BD	BD
	9/2/97	4.4	BD	BD
	9/9/97	4.4	BD	BD
	10/6/97	4.0	BD	BD
	11/17/97	3.4	BD	BD
	12/15/97	3.7	BD	BD
	2/10/98	2.7	BD	BD
	4/1/98	3.6	BD	BD
	7/8/98	3.6	BD	BD
	8/10/98	3.3	BD	BD
	10/8/98	2.9	BD	BD
	6/9/99	2.5	Phenanthrene: J Pyrene: J	BD
	6/16/99	2.4	BD	BD
Well 28	7/17/97	J	BD	BD
	8/12/97	J	BD	BD
	8/14/97	J	BD	BD
	8/19/97	J	BD	BD
	9/2/97	J	BD	BD
	9/9/97	J	BD	BD
	10/6/97	J	BD	BD
	11/17/97	BD	BD	BD
	12/15/97	J	BD	BD
	2/10/98	J	BD	BD
	4/1/98	J	BD	BD
	7/8/98	J	BD	BD
	8/10/98 **			
	8/13/98	J	BD	BD
	10/8/98	J	BD	BD
	6/9/99	0.09	Phenanthrene: J Pyrene: J	BD
	6/16/99	0.08	BD	BD

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)		
		Styrene-Acrylonitrile Trimer	Polycyclic Aromatic Hydrocarbons (PAHs)	Phthalates and Adipates (> 2 µg/l) #
Combined effluent of wells 26 + 28, after full GAC treatment	7/9/97	BD	BD	BD
	7/17/97	BD	BD	BD
	7/24/97	BD	BD	BD
	8/6/97	BD	BD	BD
	8/12/97	BD	BD	BD
	8/14/97	BD	BD	BD
	8/19/97	BD	BD	BD
	8/26/97	BD	BD	BD
	9/2/97	BD	BD	BD
	9/9/97	BD	BD	BD
	9/24/97	BD	BD	BD
	10/6/97	BD	BD	BD
	11/17/97	BD	BD	BD
	12/15/97	BD	BD	BD
	2/10/98	BD	BD	BD
	4/1/98	BD	BD	BD
	7/8/98	BD	BD	BD
	8/10/98	BD	BD	BD
	10/8/98	BD	BD	BD
	6/9/99	BD	BD	BD
	6/16/99	BD	Pyrene: J	BD

BD: All target analytes (see Table 4 for lists) were below the method detection limit (MDL); MDLs for organic chemicals may vary between chemicals, from analysis to analysis, and between methods. At the NJDHSS Laboratory, the method detection limit for styrene-acrylonitrile trimer was 0.10 µg/l through December 1998, and 0.03 µg/l beginning in January 1999. Estimated values for well 28, qualified with a "J", ranged between 0.03 and 0.08 µg/l.

J: Chemical was detected in the sample, but at a level below the method detection limit.

GAC: Granular activated carbon treatment.

Note: There is no established Maximum Contaminant Level (MCL) for styrene-acrylonitrile trimer.

A variety of phthalates were found in several samples. However, these chemicals are common and sporadic laboratory contaminants at low levels, frequently appearing in trip, field, and laboratory reagent blanks. In the laboratory data package volumes, the NJDHSS Laboratory states that phthalate levels of less than 2 or 3 µg/l are suspect. For this reason, only concentrations exceeding 2 µg/l are reported in these tables.

** Laboratory unable to analyze sample; location re-sampled 8/13/98 for method 525.2 analysis.

Table 7d. Other organic chemical results, comparison samples. Results from methods 525.2, 625, 507, 504, 505, 515, 531, and/or LC-MS. (See Table 3 for details of methods used on each sample.)

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)		
		Styrene-Acrylonitrile Trimer @	Polycyclic Aromatic Hydrocarbons (PAHs)	Phthalates and Adipates (> 2 µg/l) #
Beachwood Elementary (Beachwood)	3/28/96	Absent	BD	BD
Pine Beach Elementary (Pine Beach)	3/28/96	Absent	BD	BD
Cedar Glen #2 (Manchester)	5/6/96 8/27/96	Anr Absent	BD Anr	BD Anr
Crestwood Village #4 (Manchester)	5/6/96 See Note	Anr	BD	BD
Crestwood Village #5 (Manchester)	5/6/96 See Note	Anr	BD	BD
Norm's Dale (Egg Harbor)	5/1/96	Anr	BD	BD
Great Bear (Bottled Water)	5/1/96	Anr	BD	BD

BD: All other target analytes (see Table 4 for lists) were below the method detection limit (MDL); MDLs for organic chemicals may vary between chemicals, from analysis to analysis, and between methods.

Anr: Analysis not requested.

Note: Prometon was detected using method 507 in samples from both Crestwood Village wells (0.35 µg/l in well #4; present below the method detection limit (J) in well #5). There is no established Maximum Contaminant Level (MCL) for prometon, but the USEPA Lifetime Health Advisory level for prometon in drinking water is 100 µg/l. There is no established MCL for styrene-acrylonitrile trimer.

A variety of phthalates were found in several samples. However, these chemicals are common and sporadic laboratory contaminants at low levels, frequently appearing in trip, field, and laboratory reagent blanks. In the laboratory data package volumes, the NJDHSS Laboratory states that phthalate levels of less than 2 or 3 µg/l are suspect. For this reason, only concentrations exceeding 2 µg/l are reported in these tables.

@ Styrene-acrylonitrile (SAN) trimer was first identified in November 1996, in samples taken in March and April 1996. Prior to May 1997, when analytical methods were adapted specifically to measure SAN trimer, the possible presence or absence, but not the amount of SAN trimer could be determined. In this table, SAN trimer in samples before May 1997 is reported as "Present" if the sample showed 1, 2 or 3 of the 3 characteristic ion peaks, or "Absent" otherwise.

Table 8a. Inorganic chemical results, distribution system (school) samples: United Water Toms River community water supply, March 1996 through December 1998.

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)							
		Barium	Copper First Draw	Copper Flushed	Lead First Draw	Lead Flushed	Mercury	Molybdenum	Nickel
		MCL=2,000	AL=1,300		GL=20*		MCL=2	No MCL	No MCL
Toms River High School East	3/28/96	48	201	4	224	1	0.05	2	3
Toms River High School North	3/28/96	40	19	2	2	<1	<0.04	<2	<2
Toms River High School South	3/28/96	36	7,130	67	1,930	2	<0.04	<2	<2
Alternate Learning Center	3/28/96	13	92	13	2	2	0.09	3	<2
Toms River Intermediate East	3/28/96	48	36	2	5	3	0.06	<2	<3
Toms River Intermediate West	3/28/96 4/4/96	45 54	41 Anr	5 3	15 Anr	2 <1	0.05 0.08	2 4	3 4
Cedar Grove Elementary	3/28/96	51	173	23	8	2	0.07	<2	2
East Dover Elementary	3/28/96 4/4/96	48 39	167 Anr	71 19	5 Anr	2 <1	0.05 <0.04	<2 <2	<2 <2
Hooper Ave. Elementary	3/28/96	53	91	3	44	<1	0.13	<2	3
North Dover Elementary	3/28/96 3/29/96	32 Anr	246 256	65 Anr	10 17	4 Anr	0.26 Anr	<2 Anr	2 Anr
Silver Bay Elementary	3/28/96	51	252	213	29	5	0.13	<2	<2
South Toms River Elementary	3/28/96	13	44	3	3	<1	0.17	<2	<2
Walnut St. Elementary	3/28/96	38	227	9	4	1	0.04	<2	<2
Washington St. Elementary	3/28/96	33	143	33	5	1	<0.04	3	<2

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)							
		Barium	Copper First Draw	Copper Flushed	Lead First Draw	Lead Flushed	Mercury	Molybdenum	Nickel
		MCL=2,000	AL=1,300		GL=20*		MCL=2	No MCL	No MCL
West Dover Elementary	3/28/96	23	220	14	41	1	0.09	<2	<2
Toms River Schools Administration Building – Special Education	3/28/96 3/29/96	45 Anr	143 53	4 Anr	20 5	2 Anr	0.05 Anr	<2 Anr	<2 Anr
Ambassador Christian Academy	3/28/96	38	191	62	18	3	<0.04	<2	<2
Ocean County College	3/28/96	49	99	13	10	<1	0.07	3	<2
Ocean County VoTech	3/28/96	50	52	24	3	<1	0.08	<2	3
St. Joseph Elementary	3/28/96	39	78	10	292	2	0.05	<2	<2
Monsignor Donovan High School	3/28/96	42	40	32	8	1	0.05	<2	<2

Anr: Analysis not requested.

MCL: Maximum Contaminant Level

GL: Guidance Level

Notes: No *antimony, arsenic, beryllium, cadmium, chromium, selenium, thallium or tin* were detected in any of these distribution system (school) samples.

Asbestos was not detected in any of the distribution system (school) samples at a detection limit of 0.0325 million fibers per liter.

* The USEPA Guidance Level for lead in school drinking water samples is 20 µg/l.

Table 8b. Inorganic chemical results, point of entry and well samples: United Water Toms River community water supply, March 1996 through December 1998.

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l, unless otherwise specified)							
		Barium	Copper	Lead	Mercury	Molybdenum	Nickel	Nitrate+Nitrite	Other
		MCL = 2000	AL = 1300	AL = 15*	MCL = 2	No MCL	No MCL	MCL = 10 mg/l	See Notes for MCLs
POE 1: Holly	4/24/96	44	31	2	<0.04	4	<2	Anr	
Well 21	8/21/96	23	2	2	<0.04	5	<2	Anr	
Well 30	#								
Well 37	8/21/96	38	2	2	<0.04	2	<2	Anr	
POE 2: Brookside	6/17/96 7/8/96	52 62	<1 2	<1 <1	<0.04 <0.04	<2 4	<2 <2	Anr Anr	
Well 15	7/8/96	63	7	2	<0.04	<2	<2	Anr	
Well 43	4/2/97 5/15/97	36 Anr	<1 Anr	<1 Anr	<0.04 Anr	<1 Anr	Anr Anr	0.06 Anr	See Note A Beryllium: <1
POE 3: South Toms River	4/4/96 10/28/96	13 Anr	4 Anr	<1 Anr	0.13 Anr	<2 Anr	<2 Anr	Anr 0.11	
Well 32	4/4/96 10/28/96	12 Anr	33 Anr	<1 Anr	0.10 Anr	2 Anr	<2 Anr	Anr 0.12	
Well 38	10/16/96	63	10	3	<0.04	8	3	Anr	See Note B
POE 4: Indian Head	4/4/96 10/28/96	49 Anr	7 Anr	<1 Anr	0.14 Anr	<2 Anr	3 Anr	Anr 2.4	
Well 20	4/4/96	47	16	4	0.12	2	2	Anr	
POE 5: Route 70	4/4/96 10/28/96	35 Anr	65 Anr	<1 Anr	0.24 Anr	4 Anr	3 Anr	Anr 1.1	Selenium: 2.0

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l, unless otherwise specified)							
		Barium	Copper	Lead	Mercury	Molybdenum	Nickel	Nitrate+Nitrite	Other
		MCL = 2000	AL = 1300	AL = 15*	MCL = 2	No MCL	No MCL	MCL = 10 mg/l	See Notes for MCLs
Well 31	4/4/96 10/28/96	27 Anr	16 Anr	4 Anr	0.14 Anr	<2 Anr	<2 Anr	Anr 1.1	
POE 6: Berkeley	4/4/96 10/28/96	23 Anr	3 Anr	<1 Anr	0.07 Anr	<2 Anr	<2 Anr	Anr 1.1	
Well 33	4/4/96 7/8/96 (2) 10/28/96	20 Anr Anr	17 Anr Anr	80 10; 11 Anr	0.12 Anr Anr	3 Anr Anr	<2 Anr Anr	Anr Anr 1.0	
Well 34	10/16/96 10/28/96	30 Anr	13 Anr	3 Anr	<0.04 Anr	<2 Anr	<2 Anr	Anr 1.3	Chromium: 1.1 Cadmium: 1.1 See Note C
Well 35	7/8/96 10/28/96	27 Anr	35 Anr	11 Anr	0.1 Anr	5 Anr	<2 Anr	Anr 1.3	
POE 7: Parkway	4/4/96 10/28/96	51 Anr	2 Anr	3 Anr	0.05 Anr	<2 Anr	4 Anr	Anr 0.9	
Well 22	4/4/96 10/28/96	39 Anr	7 Anr	<1 Anr	<0.04 Anr	4 Anr	<2 Anr	Anr 1.5	
Well 24	10/10/96 10/28/96	49 Anr	2 Anr	1 Anr	0.21 Anr	12 Anr	8 Anr	Anr 0.9	
Well 26	4/4/96 10/28/96	68 Anr	8 Anr	1 Anr	0.14 Anr	2 Anr	4 Anr	Anr 1.8	
Well 28	4/4/96 10/28/96	35 Anr	2 Anr	2 Anr	0.06 Anr	<2 Anr	2 Anr	Anr 1.5	
Wells 26+28 after air stripper	4/4/96	54	2	<1	0.10	<2	3	Anr	

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l, unless otherwise specified)							
		Barium	Copper	Lead	Mercury	Molybdenum	Nickel	Nitrate+Nitrite	Other
		MCL = 2000	AL = 1300	AL = 15*	MCL = 2	No MCL	No MCL	MCL = 10 mg/l	See Notes for MCLs
Well 29	4/4/96 10/28/96	72 Anr	12 Anr	1 Anr	0.11 Anr	<2 Anr	8 Anr	Anr 0.4	
Well 39	8/21/96	11	2	<1	<0.04	<2	2	Anr	Arsenic: 1.3
Well 41	8/21/96	24	<1	1	<0.04	4	<2	Anr	
Well 42	4/4/96 10/28/96	76 Anr	3 Anr	<1 Anr	<0.04 Anr	<2 Anr	<2 Anr	Anr 0.08	
Well 44	10/10/96	61	3	4	0.64	9	5	0.53	Chromium: 1.2 See Note D
Well 45	2/11/98	75	29	3	<0.04	Anr	<1	0.07	See Note E
POE 12: Windsor	6/17/96 7/8/96	9 54	1 2	<1 <1	<0.04 <0.04	<2 3	<2 <2	Anr Anr	
Well 40	7/8/96	20	3	<1	0.16	2	<2	Anr	

Anr: Analysis not requested.

MCL: Maximum Contaminant Level

AL: Action Level

Notes: No *antimony, beryllium, thallium or tin* were detected in point of entry or well samples. Unless otherwise noted in the "Other" column, no *arsenic, cadmium, chromium, or selenium* were detected in the point of entry or well samples. MCLs for the following metals are: arsenic, 50 µg/l; cadmium, 5 µg/l; chromium, 100 µg/l, and selenium, 50 µg/l.

A: The 4/2/97 sample of well 43 was also tested for the following: asbestos, < 0.018 million fibers per liter (MCL = 7 mf/l); iron, 2,390 µg/l (recommended upper limit = 300 µg/l); sodium, 5,300 µg/l (recommended upper limit 50,000 µg/l); manganese, 45 µg/l (recommended upper limit = 50 µg/l); and zinc, 8 µg/l, recommended upper limit = 5,000 µg/l).

B: The 10/16/96 sample of well 38 was also tested for the following: aluminum, 186 µg/l (recommended upper limit =200 µg/l); iron, 1,480 µg/l (recommended upper limit = 300 µg/l); sodium, 2,800 µg/l (recommended upper limit 50,000 µg/l); manganese, 16 µg/l (recommended upper limit = 50 µg/l); and zinc, 15 µg/l, recommended upper limit = 5,000 µg/l).

C: The 10/16/96 sample of well 34 was also tested for the following: aluminum, 176 µg/l (recommended upper limit =200 µg/l); iron, 116 µg/l (recommended upper limit = 300 µg/l); sodium, 5,700 µg/l (recommended upper limit 50,000 µg/l); manganese, 37 µg/l (recommended upper limit = 50 µg/l); and zinc, 26 µg/l, recommended upper limit = 5,000 µg/l).

D: The 10/10/96 sample of well 44 was also tested for the following: asbestos, < 0.018 million fibers per liter (MCL = 7 mf/l); aluminum, 35 µg/l (recommended upper limit =200 µg/l); iron, 44 µg/l (recommended upper limit = 300 µg/l); sodium, 6,700 µg/l (recommended upper limit 50,000 µg/l); manganese, 26 µg/l (recommended upper limit = 50 µg/l); and zinc, 9 µg/l, (recommended upper limit = 5,000 µg/l).

E: The 2/11/98 sample of well 45 was also tested for the following: asbestos, < 0.037 million fibers per liter (MCL = 7 mf/l); aluminum, 90 µg/l (recommended upper limit =200 µg/l); iron, 1,380 µg/l (recommended upper limit = 300 µg/l); sodium, 6,300 µg/l (recommended upper limit 50,000 µg/l); manganese, 26 µg/l (recommended upper limit = 50 µg/l); silver, < 1 µg/l (recommended upper limit = 100 µg/l); and zinc, 9 µg/l, (recommended upper limit = 5,000 µg/l).

Well not sampled for inorganics. Holly point of entry sample of 4/24/96 represents well 30 since the well was the only one pumping at the time of sampling.

* The USEPA Action Level for lead is 15 µg/l based on the 90th percentile of representative samples in the distribution system.

Table 8c. Inorganic chemical results, comparison samples.

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in micrograms per liter, or µg/l)								
		Barium	Copper First Draw	Copper Flushed	Lead First Draw	Lead Flushed	Mercury	Molybdenum	Nickel	Other
		MCL=2,000	AL=1,300		GL=15; AL=20*		MCL=2	No MCL	No MCL	See Notes
Beachwood Elementary (Beachwood)	3/28/96	49	24	10	5	3	<0.04	<2	<2	
Pine Beach Elementary (Pine Beach)	3/28/96	56	45	10	5	1	<0.04	<2	<2	
Cedar Glen #2 (Manchester)	5/6/96	20	NA	5	NA	1	<0.04	<2	<2	
Crestwood Village #4 (Manchester)	5/6/96	31	NA	17	NA	1	0.32	<2	<2	
Crestwood Village #5 (Manchester)	5/6/96	30	NA	15	NA	3	0.18	3	3	
Norm's Dale (Egg Harbor)	5/1/96	47	NA	30	NA	5	0.06	4	<2	Chromium: 37
Great Bear (Bottled Water)	5/1/96	9	NA	1	NA	2	0.04	4	<2	

MCL: Maximum Contaminant Level

AL: Action Level

GL: Guidance Level

NA: Not applicable.

Notes: No *antimony, arsenic, beryllium, cadmium, selenium, thallium or tin* were detected in any of these comparison samples. *Asbestos* was not detected in any of the comparison samples at a detection limit of 0.0325 million fibers per liter.

The MCL for chromium is 100 µg/l.

* The USEPA Guidance Level for lead in school drinking water samples is 20 µg/l. The USEPA Action Level for lead is 15 µg/l based on the 90th percentile of representative samples in the distribution system.

Table 9a. Radiological activity results, distribution (school, hydrant and other) samples: United Water Toms River community water supply, March 1996 through December 1998.

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in picoCuries per liter, or pCi/l)				
		Gross Alpha	Gross Beta	Radium-226	Radium-228	Combined Radium
		MCL= 15 pCi/l (See Note A)	MCL: See Note B	MCL = 5 pCi/L for Combined Radium 226+228		
Toms River High School East	3/28/96	4.8 ± 1.0	6.7 ± 0.5	1.0 ± 0.2	1.1 ± 0.4	2.1 ± 0.4
Toms River High School North	3/28/96	4.0 ± 0.9	6.1 ± 0.5	Anr	Anr	Anr
Toms River High School South	3/28/96	3.5 ± 0.8	6.5 ± 0.5	Anr	Anr	Anr
Alternate Learning Center	3/28/96	0.9 ± 0.6	1.3 ± 0.3	Anr	Anr	Anr
Toms River Intermediate East	3/28/96	5.8 ± 1.3	6.2 ± 0.7	1.0 ± 0.2	1.0 ± 0.3	2.0 ± 0.4
Toms River Intermediate West	3/28/96	9.1 ± 1.5	6.5 ± 0.7	1.1 ± 0.2	1.2 ± 0.3	2.3 ± 0.4
Cedar Grove Elementary	3/28/96	7.4 ± 1.0	6.6 ± 0.5	1.3 ± 0.3	1.2 ± 0.3	2.5 ± 0.4
East Dover Elementary	3/28/96	4.0 ± 1.0	5.8 ± 0.6	Anr	Anr	Anr
Hooper Ave. Elementary	3/28/96	7.8 ± 1.2	7.4 ± 0.5	1.4 ± 0.3	1.0 ± 0.4	2.4 ± 0.5
North Dover Elementary	3/28/96	11 ± 1	5.7 ± 0.6	2.1 ± 0.3	1.3 ± 0.3	3.4 ± 0.4
Silver Bay Elementary	3/28/96	12 ± 2	6.8 ± 0.6	1.6 ± 0.2	1.1 ± 0.4	2.7 ± 0.4
South Toms River Elementary	3/28/96	2.4 ± 0.8	1.7 ± 0.4	Anr	Anr	Anr
Walnut St. Elementary	3/28/96	3.0 ± 0.8	5.4 ± 0.5	Anr	Anr	Anr
Washington St. Elementary	3/28/96	2.9 ± 0.8	4.9 ± 0.6	Anr	Anr	Anr
West Dover Elementary	3/28/96	4.4 ± 0.7	4.4 ± 0.4	0.7 ± 0.2	< 0.6	0.7 ± 0.2

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in picoCuries per liter, or pCi/l)				
		Gross Alpha	Gross Beta	Radium-226	Radium-228	Combined Radium
		MCL= 15 pCi/l (See Note A)	MCL: See Note B	MCL = 5 pCi/L for Combined Radium 226+228		
Toms River Schools Administration Building – Special Education	3/28/96	7.1 ± 1.2	6.0 ± 0.6	1.2 ± 0.3	< 0.6	1.2 ± 0.3
Ambassador Christian Academy	3/28/96	2.3 ± 0.7	6.1 ± 0.6	Anr	Anr	Anr
Ocean County College	3/28/96	7.4 ± 1.2	6.7 ± 0.6	1.0 ± 0.2	1.1 ± 0.2	2.1 ± 0.3
Ocean County VoTech	3/28/96	7.8 ± 1.3	6.5 ± 0.7	1.1 ± 0.3	1.1 ± 0.4	2.2 ± 0.5
St. Joseph Elementary	3/28/96	4.5 ± 0.9	6.4 ± 0.6	0.6 ± 0.2	< 0.5	0.6 ± 0.2
Monsignor Donovan H. S.	3/28/96	5.1 ± 0.7	6.2 ± 0.4	0.8 ± 0.2	< 0.5	0.8 ± 0.2
Hydrant: Primrose & Columbine	7/11/96 7/16/97 6/9/99	7.9 ± 1.5 9.3 ± 1.5 8.0 ± 0.4	7.0 ± 0.8 Anr Anr	1.8 ± 0.3 1.5 ± 0.2 1.1 ± 0.2	1.7 ± 0.5 4.8 ± 0.7 1.4 ± 0.5	3.5 ± 0.6 6.3 ± 0.9 2.5 ± 0.7
Hydrant: Rte. 571 Pathmark	7/11/96 7/16/97 6/9/99	3.4 ± 1.0 11 ± 2 6.2 ± 0.4	3.6 ± 0.7 Anr Anr	Anr 1.8 ± 0.2 1.5 ± 0.3	Anr 1.5 ± 0.4 1.1 ± 0.3	Anr 3.3 ± 0.6 2.6 ± 0.6
Rte. 527 Upstream of POE 5	7/1/97	14 ± 2	Anr	1.5 ± 0.2	1.4 ± 0.4	2.9 ± 0.6
Rte. 527 Downstream of POE 5	7/1/97	14 ± 2	Anr	1.7 ± 0.2	2.4 ± 0.5	4.1 ± 0.5
Hydrant: Mueller & Santiago	7/1/97	22 ± 2	Anr	2.8 ± 0.3	3.6 ± 0.6	6.4 ± 0.7
Hydrant: Santiago & Pulaski	7/1/97	16 ± 2	Anr	1.3 ± 0.2	1.8 ± 0.4	3.1 ± 0.4
UWTR Main Office	7/1/97	8.1 ± 1.5	Anr	0.4 ± 0.1	0.6 ± 0.3	1.1 ± 0.5
Rte. 37 & Fischer	7/1/97	0.4 ± 0.6	Anr	Anr	Anr	Anr

Anr: Analysis not requested

MCL: Maximum Contaminant Level

Notes: A. If gross alpha activity in the sample exceeds 5 pCi/L, radium analyses are conducted.

B. The MCL for gross beta activity is 4 millirems per year (mrem/yr), a measure of body dose. Analytical results are expressed in picoCuries per liter (pCi/l), a measure of radioactivity in a sample of water. Beta-emitting radionuclides produce different body radiation doses at equivalent activity levels in water. If a sample exceeds a gross beta activity of 50 pCi/l, the activities of specific radionuclides must be determined so that dose can be calculated.

Table 9b. Radiological activity results, point of entry and well samples: United Water Toms River community water supply, March 1996 through December 1998. See Table 11b for results of radon, uranium, thorium, and gamma spectroscopy tests. (See also Table 12 for additional radiological test results of a short-term variability study, June 10-14, 1996.)

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in picoCuries per liter, or pCi/l)				
		Gross Alpha	Gross Beta	Radium-226	Radium-228	Combined Radium
		MCL = 15 pCi/l (See Note A)	MCL: See Note B	MCL = 5 pCi/l for Combined Radium 226+228		
POE 1: Holly	4/25/96 12/5/96 1/13/97	0.7 ± 0.5 18 ± 2 9.3 ± 1.3	5.1 ± 0.5 Anr Anr	0.08 ± 0.2 0.4 ± 0.2 0.2 ± 0.2	< 0.6 <0.5 <0.5	0.08 ± 0.2 0.4 ± 0.2 0.2 ± 0.2
Well 21	9/3/96	12 ± 1	6.4 ± 0.6	0.7 ± 0.2	1.2 ± 0.3	1.9 ± 04
Well 30	#					
Well 37	9/3/96	2.0 ± 0.7	5.2 ± 0.6	Anr	Anr	Anr
POE 2: Brookside	6/17/96	0.9 ± 0.4	3.2 ± 0.4	Anr	Anr	Anr
Well 15	5/20/96 6/5/97	0.9 ± 0.4 1.4 ± 0.4	3.7 ± 0.4 Anr	Anr Anr	Anr Anr	Anr Anr
Well 43	4/2/97	1.7 ± 0.4	3.5 ± 0.3	Anr	Anr	Anr
POE 3: South Toms River	4/4/96 4/25/96 7/19/96 6/5/97	4.5 ± 0.9 2.6 ± 0.8 1.3 ± 0.6 11 ± 7	3.3 ± 0.5 2.1 ± 0.5 1.4 ± 0.3 Anr	0.5 ± 0.2 0.4 ± 0.2 Anr 0.4 ± 0.3	< 0.6 < 0.6 Anr < 0.8	0.5 ± 0.2 0.4 ± 0.2 Anr 0.4 ± 0.3
Well 32	#					
Well 38	10/16/96	13 ± 1	Anr	0.7 ± 0.4	0.8 ± 0.2	1.5 ± 0.4

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in picoCuries per liter, or pCi/l)				
		Gross Alpha	Gross Beta	Radium-226	Radium-228	Combined Radium
		MCL = 15 pCi/l (See Note A)	MCL: See Note B	MCL = 5 pCi/l for Combined Radium 226+228		
POE 4: Indian Head	4/4/96	26 ± 2	12 ± 1	2.0 ± 0.3	2.4 ± 0.4	4.4 ± 0.5
	4/9/96	23 ± 2	11 ± 1	1.8 ± 0.3	2.0 ± 0.4	3.8 ± 0.5
	7/10/96	8.7 ± 1.4	7.3 ± 1.1	2.1 ± 0.3	2.2 ± 0.4	4.3 ± 0.5
	7/11/96	10 ± 2	6.4 ± 0.8	1.9 ± 0.3	2.0 ± 0.5	3.9 ± 0.6
	7/12/96	10 ± 2	7.9 ± 1.0	2.4 ± 0.4	2.3 ± 0.5	4.7 ± 0.6
	7/16/97	17 ± 2	Anr	1.8 ± 0.3	2.6 ± 0.5	4.4 ± 0.6
Well 20	4/9/96	26 ± 2	11 ± 1	2.1 ± 0.3	2.1 ± 0.5	4.2 ± 0.6
	4/25/96	12 ± 1	8.0 ± 0.5	1.9 ± 0.3	2.0 ± 0.4	3.9 ± 0.7
	5/20/96	16 ± 1	9.8 ± 6	2.4 ± 0.3	2.2 ± 0.5	4.6 ± 0.6
	7/10/96	9.7 ± 1.1	6.7 ± 0.5	2.1 ± 0.3	1.9 ± 0.5	4.0 ± 0.6
	7/11/96	9.5 ± 1.1	7.1 ± 0.6	2.1 ± 0.3	2.1 ± 0.6	4.2 ± 0.7
	7/12/96	9.9 ± 1.1	6.8 ± 0.5	2.3 ± 0.3	1.9 ± 0.5	4.2 ± 0.6
	12/5/96	26 ± 1	Anr	2.6 ± 0.3	2.2 ± 0.3	4.8 ± 0.6
	1/13/97	27 ± 1	Anr	2.2 ± 0.2	2.3 ± 0.4	4.5 ± 0.6
	4/10/97	26 ± 1	Anr	1.4 ± 0.2	1.3 ± 0.4	2.7 ± 046
	5/27/97	6.2 ± 0.6	Anr	0.9 ± 0.2	< 0.6	0.9 ± 0.2
	6/5/97	25 ± 1	Anr	2.2 ± 0.3	2.2 ± 0.5	4.4 ± 0.6
	6/9/99	15 ± 1	Anr	2.4 ± 0.3	2.4 ± 0.5	4.8 ± 0.8
POE 5: Route 70	4/4/96	29 ± 1	14 ± 1	3.5 ± 0.4	2.5 ± 0.7	6.0 ± 0.8
	4/9/96	37 ± 3	17 ± 1	4.0 ± 0.4	3.1 ± 0.5	7.1 ± 0.6
	7/19/96	6.0 ± 1	3.4 ± 0.5	2.4 ± 0.3	1.6 ± 0.4	4.0 ± 0.5
	12/5/96	13 ± 1	Anr	1.6 ± 0.3	< 0.6	1.6 ± 0.3
	1/13/97	18 ± 2	Anr	2.5 ± 0.3	1.8 ± 0.4	4.3 ± 0.5
	6/5/97	11 ± 1	Anr	1.6 ± 0.3	< 0.8	1.6 ± 0.3
	7/1/97	12 ± 2	Anr	1.4 ± 0.2	1.1 ± 0.4	2.5 ± 0.4

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in picoCuries per liter, or pCi/l)				
		Gross Alpha	Gross Beta	Radium-226	Radium-228	Combined Radium
		MCL = 15 pCi/l (See Note A)	MCL: See Note B	MCL = 5 pCi/l for Combined Radium 226+228		
Well 31	4/9/96 4/25/96 5/20/96 2/10/97 7/16/97 (2)	10 ± 1 5.2 ± 0.6 3.4 ± 0.3 9.4 ± 0.6 10 ± 1; 11 ± 1	5.4 ± 0.4 3.9 ± 0.4 3.0 ± 0.2 Anr Anr; Anr	1.5 ± 0.3 1.3 ± 0.3 Anr 1.6 ± 0.3 1.8 ± 0.2; 1.8 ± 0.2	1.1 ± 0.4 < 0.6 Anr 1.3 ± 0.4 1.5 ± 0.5; 1.2 ± 0.4	2.6 ± 0.5 1.3 ± 0.3 Anr 2.9 ± 0.5 3.3 ± 0.5; 3.0 ± 0.6
POE 6: Berkeley	4/4/96 4/25/96 7/19/96 12/5/96 1/13/97 6/5/97 7/1/97	18 ± 2 6.1 ± 1.1 5.8 ± 1.0 18 ± 2 18 ± 2 13 ± 1 19 ± 2	8.2 ± 0.6 5.3 ± 0.6 4.0 ± 0.4 Anr Anr Anr Anr	1.2 ± 0.2 1.0 ± 0.3 1.2 ± 0.3 1.0 ± 0.2 1.0 ± 0.2 1.2 ± 0.3 1.0 ± 0.2	1.9 ± 0.6 1.6 ± 0.7 1.9 ± 0.5 1.4 ± 0.4 1.4 ± 0.4 1.6 ± 0.5 1.5 ± 0.4	3.1 ± 0.6 2.6 ± 0.4 3.1 ± 0.6 2.4 ± 0.5 2.4 ± 0.5 2.8 ± 0.6 2.5 ± 0.4
Well 33	#					
Well 34	10/16/98	14 ± 1	Anr	1.8 ± 0.6	1.0 ± 0.2	2.8 ± 0.6
Well 35	#					
POE 7: Parkway	4/4/96 4/25/96 7/19/96 6/5/97 7/1/97	15 ± 2 9.0 ± 1.6 7.4 ± 1.0 8.3 ± 1.2 10 ± 2	9.5 ± 0.7 7.1 ± 0.9 5.4 ± 0.6 Anr Anr	1.7 ± 0.3 1.4 ± 0.3 1.8 ± 0.3 0.6 ± 0.3 1.1 ± 0.2	1.7 ± 0.4 1.5 ± 0.4 1.4 ± 0.5 < 0.6 1.3 ± 0.4	3.4 ± 0.5 2.9 ± 0.5 3.2 ± 0.6 0.6 ± 0.3 2.4 ± 0.4
Well 22	4/4/96 @ 5/27/97	Anr 1.6 ± 0.6	Anr Anr	Anr Anr	Anr Anr	Anr Anr
Well 24	10/10/96 5/27/97	12 ± 1 1.9 ± 0.6	Anr Anr	2.6 ± 0.5 Anr	1.9 ± 0.3 Anr	4.5 ± 0.6 Anr
Well 26	4/4/96 @	Anr	Anr	Anr	Anr	Anr

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in picoCuries per liter, or pCi/l)				
		Gross Alpha	Gross Beta	Radium-226	Radium-228	Combined Radium
		MCL = 15 pCi/l (See Note A)	MCL: See Note B	MCL = 5 pCi/l for Combined Radium 226+228		
Well 28	4/4/96 @	Anr	Anr	Anr	Anr	Anr
Wells 26+28 after air stripper	4/4/96	13 ± 1	7.6 ± 0.6	1.0 ± 0.2	< 0.7	1.0 ± 0.2
Well 29	4/4/96 @ 5/27/97 6/5/97	Anr 25 ± 1 24 ± 1	Anr Anr Anr	Anr 2.6 ± 0.2 2.5 ± 0.4	Anr 2.4 ± 0.5 2.1 ± 0.5	Anr 5.0 ± 0.7 4.6 ± 0.6
Well 39	9/3/96 7/23/97	2.5 ± 0.5 1.9 ± 0.4	2.9 ± 0.4 4.4 ± 0.3	Anr < 0.1	Anr < 0.6	Anr < 0.6
Well 41	9/3/96 7/23/97	1.1 ± 0.4 1.0 ± 0.3	3.2 ± 0.4 3.7 ± 0.3	Anr 0.3 ± 0.3	Anr < 0.5	Anr 0.3 ± 0.3
Well 42	4/4/96 @ 6/5/97	Anr 3.7 ± 0.9	Anr Anr	Anr Anr	Anr Anr	Anr Anr
Well 44	10/10/96 5/27/97 6/5/97	3.6 ± 0.6 23 ± 2 8.6 ± 0.8	Anr Anr Anr	Anr 2.2 ± 0.3 0.9 ± 0.3	Anr 2.0 ± 0.5 < 0.7	Anr 4.2 ± 0.6 0.9 ± 0.3
Well 45	2/11/98	5.9 ± 0.8	Anr	0.5 ± 0.2	1.0 ± 0.4	1.5 ± 0.4
POE 12: Windsor	6/17/96 12/5/96 1/13/97	0.4 ± 0.3 0.8 ± 0.5 0.5 ± 0.6	3.5 ± 0.4 Anr Anr	Anr Anr Anr	Anr Anr Anr	Anr Anr Anr
Well 40	5/20/96	0.6 ± 0.4	4.5 ± 0.4	Anr	Anr	Anr

Anr: Analysis not requested

MCL: Maximum Contaminant Level

Notes: A. If gross alpha activity in the sample exceeds 5 pCi/L, radium analyses are conducted.

B. The MCL for gross beta activity is 4 millirems per year (mrem/yr), a measure of body dose. Analytical results are expressed in picoCuries per liter (pCi/l), a measure of radioactivity in a sample of water. Beta-emitting radionuclides produce different body radiation doses at equivalent activity levels in water. If a sample exceeds a gross beta activity of 50 pCi/l, the activities of specific radionuclides must be determined so that dose can be calculated.

Well not sampled for radiological activity.

* Data for samples from wells 26 and 28 and air-stripped water are presented only for the time period prior to November 1996.

@ Samples analyzed for radon only.

Table 9c. Other radiological activity results, point of entry and well samples: United Water Toms River community water supply, March 1996 through December 1998.

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in picoCuries per liter, or pCi/l)			
		Uranium	Thorium	Radon	Gamma Spectroscopy
		No MCL	No MCL	Proposed MCL: 300	No MCL
POE 1: Holly	#				
Well 21	#				
Well 30	#				
Well 37	#				
POE 2: Brookside	6/17/96	Anr	Anr	110 ± 20	Anr
Well 15	#				
Well 43	#				
POE 3: South Toms River	6/10/96	Anr	Anr	Anr	BD
Well 32	#				
Well 38	6/10/96 10/16/96	Anr Anr	Anr Anr	Anr 110 ± 20	BD Anr
POE 4: Indian Head	4/4/96 4/9/96	U-238: < 0.03 U-235: < 0.02 U-234: < 0.04 U- 238: 0.04 ± 0.01 U-235: < 0.02 U-234: 0.07 ± 0.02	Anr Anr	Anr Anr	Anr Anr

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in picoCuries per liter, or pCi/l)			
		Uranium	Thorium	Radon	Gamma Spectroscopy
		No MCL	No MCL	Proposed MCL: 300	No MCL
Well 20	4/9/96	U-238: 0.03 ± 0.01 U-235: 0.006 ± 0.006 U-234: 0.06 ± 0.02	Anr	Anr	Anr
	5/20/96	U-238: < 0.02 U-235: Anr U-234: < 0.02	Th-228: 0.13 ± 0.02 Th-230: < 0.02 Th-232: 0.06 ± 0.01	Anr	Anr
POE 5: Route 70	4/4/96	U-238: 0.15 ± 0.03 U-235: < 0.03 U-234: 0.17 ± 0.03	Anr	Anr	BD
	4/9/96	U-238: 0.76 ± 0.11 U-235: 0.04 ± 0.02 U-234: 0.7 ± 0.1	Anr	Anr	Anr
	6/10/96	Anr	Anr	Anr	BD
Well 31	4/9/96	U-238: < 0.04 U-235: < 0.03 U-234: < 0.06	Anr	Anr	Anr
	6/10/96	Anr	Anr	Anr	BD
POE 6: Berkeley	4/4/96	U-238: < 0.04 U-235: < 0.02 U-234: < 0.05	Anr	Anr	Anr
Well 33	#				
Well 34	10/16/98	Anr	Anr	220 ± 20	Anr
Well 35	#				
POE 7: Parkway	4/4/96	U-238: 0.07 ± 0.02 U-235: < 0.01 U-234: 0.07 ± 0.02	Anr	200 ± 20	Anr
Well 22	4/4/96	Anr	Anr	200 ± 20	Anr

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in picoCuries per liter, or pCi/l)			
		Uranium	Thorium	Radon	Gamma Spectroscopy
		No MCL	No MCL	Proposed MCL: 300	No MCL
Well 24	10/10/96	Anr	Anr	210 ± 30	Anr
Well 26	4/4/96	Anr	Anr	410 ± 50	Anr
Well 28	4/4/96	Anr	Anr	210 ± 20	Anr
Wells 26+28 after air stripper*	4/4/96	Anr	Anr	130 ± 180	Anr
Well 29	4/4/96	Anr	Anr	280 ± 20	Anr
Well 39	#				
Well 41	#				
Well 42	4/4/96	Anr	Anr	150 ± 20	Anr
Well 44	10/10/96	Anr	Anr	220 ± 60	Anr
Well 45	2/11/98	Anr	Anr	190 ± 20	Anr
POE 12: Windsor	6/17/96	Anr	Anr	76 ± 14	Anr
Well 40	#				

BD: No evidence of target radionuclides.

Anr: Analysis not requested

MCL: Maximum Contaminant Level

Point of entry or well not sampled for uranium, thorium, or radon activity, or for gamma spectroscopy.

Table 9d. Short-term variability study at selected points of entry and well samples: United Water Toms River community water supply, June 10-14, 1996.

SAMPLE LOCATION	SAMPLE DATE	SAMPLE TIME	MEASUREMENT (in picoCuries per liter, or pCi/l)	
			Gross Alpha	Gross Beta
			MCL = 15 pCi/l	See Note B, Table 11
POE 3: South Toms River	6/10/96	11:00	3.2 ± 0.7	3.8 ± 0.4
		12:00	3.3 ± 0.7	3.4 ± 0.4
		13:00	3.0 ± 0.7	3.6 ± 0.4
		14:00	2.6 ± 0.7	2.8 ± 0.4
		15:00	2.7 ± 0.6	2.5 ± 0.3
		16:00	2.3 ± 0.6	2.6 ± 0.4
		17:00	2.8 ± 0.7	2.6 ± 0.4
	6/11/96	12:30	1.2 ± 0.9	2.0 ± 0.6
	6/12/96	09:30	1.5 ± 0.9	2.2 ± 0.6
	6/13/96	09:45	1.7 ± 0.9	2.4 ± 0.6
	6/14/96	10:30	2.2 ± 0.8	3.3 ± 0.6
Well 38	6/10/96	10:55	1.9 ± 0.4	2.4 ± 0.3
		11:55	2.1 ± 0.4	2.9 ± 0.3
		12:55	2.5 ± 0.4	2.6 ± 0.3
		13:55	1.6 ± 0.4	2.5 ± 0.3
		14:55	2.3 ± 0.4	2.7 ± 0.3
		15:55	1.9 ± 0.4	2.6 ± 0.3
		16:55	1.6 ± 0.4	2.7 ± 0.3
	6/11/96	12:00	1.0 ± 0.3	2.0 ± 0.3
	6/12/96	09:00	1.1 ± 0.3	2.1 ± 0.3
	6/13/96	09:15	2.5 ± 0.4	2.7 ± 0.3
	6/14/96	10:10	2.3 ± 0.4	2.7 ± 0.3
POE 5: Route 70	6/10/96	11:05	5.6 ± 1.0	3.9 ± 0.4
		12:10	4.7 ± 0.8	3.2 ± 0.5
		13:08	6.4 ± 1.0	4.0 ± 0.4
		14:12	4.6 ± 0.9	3.2 ± 0.5
		15:14	5.1 ± 0.9	3.6 ± 0.4
		16:18	6.0 ± 1.0	3.7 ± 0.4
		17:25	5.3 ± 1.0	3.8 ± 0.4
	6/11/96	14:00	2.7 ± 1.0	2.5 ± 0.6
	6/12/96	10:30	6.2 ± 1.0	6.7 ± 0.8
	6/13/96	11:00	1.9 ± 0.9	2.8 ± 0.6
	6/14/96	11:30	3.3 ± 0.7	3.0 ± 0.7

SAMPLE LOCATION	SAMPLE DATE	SAMPLE TIME	MEASUREMENT (in picoCuries per liter, or pCi/l)	
			Gross Alpha	Gross Beta
			MCL = 15 pCi/l	See Note B, Table 11
Well 31	6/10/96	11:20	5.5 ± 0.7	3.4 ± 0.3
		12:20	4.7 ± 0.7	3.1 ± 0.3
		13:14	4.1 ± 0.6	3.3 ± 0.3
		14:18	5.4 ± 0.7	3.1 ± 0.3
		15:20	5.0 ± 0.6	3.7 ± 0.3
		16:14	4.2 ± 0.6	3.3 ± 0.3
		17:19	5.6 ± 0.7	3.1 ± 0.3
	6/11/96	13:30	3.5 ± 0.5	2.9 ± 0.3
	6/12/96	10:15	2.9 ± 0.5	2.9 ± 0.3
	6/13/96	10:30	4.6 ± 0.6	3.3 ± 0.4
	6/14/96	11:45	5.4 ± 0.7	3.8 ± 0.4

Table 9e. Radiological activity results, comparison samples.

SAMPLE LOCATION	SAMPLE DATE	MEASUREMENT (in picoCuries per liter, or pCi/l)				
		Gross Alpha	Gross Beta	Radium-226	Radium-228	Combined Radium
		MCL= 15 pCi/l (See Note A)	MCL: See Note B	MCL = 5 pCi/L for Combined Radium 226+228		
Beachwood Elementary (Beachwood)	3/28/96	0.2 ± 0.5	2.0 ± 0.4	Anr	Anr	Anr
Pine Beach Elementary (Pine Beach)	3/28/96	1.8 ± 0.7	2.6 ± 0.4	Anr	Anr	Anr
Cedar Glen #2 (Manchester)	5/6/96	1.9 ± 0.4	1.9 ± 0.3	Anr	Anr	Anr
Crestwood Village #4 (Manchester)	5/6/96	6.4 ± 0.8	4.4 ± 0.4	1.4 ± 0.3	< 0.7	1.4 ± 0.3
Crestwood Village #5 (Manchester)	5/6/96	3.6 ± 0.7	2.3 ± 0.3	Anr	Anr	Anr
Norm's Dale (Egg Harbor)	5/2/96	1.5 ± 0.3	1.5 ± 0.2	0.04 ± 0.2	< 0.5	0.04 ± 0.2
Great Bear (Bottled Water)	5/1/96	0.2 ± 0.2	0.8 ± 0.3	0.2 ± 0.1	< 0.6	0.2 ± 0.1

Anr: Analysis not requested

MCL: Maximum Contaminant Level

Notes: A. If gross alpha activity in the sample exceeds 5 pCi/L, radium analyses are conducted.

B. The MCL for gross beta activity is 4 millirems per year (mrem/yr), a measure of body dose. Analytical results are expressed in picoCuries per liter (pCi/l), a measure of radioactivity in a sample of water. Beta-emitting radionuclides produce different body radiation doses at equivalent activity levels in water. If a sample exceeds a gross beta activity of 50 pCi/l, the activities of specific radionuclides must be determined so that dose can be calculated.